

## CHAPTER 9 ARCHEOLOGICAL INVESTIGATIONS

### Introduction

In November 1997, a previously unidentified brick foundation was discovered in the course of road construction activities associated with the improvement of Road 214 adjacent to Cubbage Pond. Responding immediately to the “late discovery,” DelDOT contracted GAI to investigate the site. Over the next three months, GAI conducted a series of archeological investigations designed to identify, evaluate, and ultimately mitigate the disturbance to archeological resources related to a mill (Site 7S-C-61) encountered at this location.

Cubbage Mill (Site 7S-C-61) was found buried three to eight feet beneath the existing road (Photograph 9.1). Because repair of this bridge crossing was necessary and the site could not be avoided, data recovery investigations were necessary. The general excavation strategy employed limited hand excavation and hand-stripping, and the use of mechanical equipment to remove the soils and roadbed above intact architectural remnants of the mill. Mechanical excavations, supervised by an archeologist, permitted the excavation of large volumes of earth in a short span of time without damaging archeological remains. The construction contractor built a cofferdam at the east end of Cubbage Pond (around the excavation area) to allow for bridge construction within and immediately adjacent to an earthen dam.



*Photograph 9.1*

*Excavation of Waterpower System, Cubbage Mill Site. Looking North. Note location of trackhoe on Road 214 above site, and cofferdam to west (left).*

Excavated mill remains comprised part of the mill building and waterpower system (Figure 9.1). Cubbage Mill Site 7S-C-61 presented many different construction elements. [A feature (e.g., brick wall, concrete floor) in one location was not necessarily the same feature in another excavated location; for this reason, the practice of assigning feature numbers was halted after the first six numbers were assigned (Table 9.1).]

**Table 9.1**  
**Feature Numbers Assigned during Excavations**

Feature No.	Description
1	Brick mill foundation, log sills, brick piers, wood piers
2	Concrete floor (within brick foundation only)
3	Layer of burned debris in TU1
4	Brick floor
5	Posthole (post-dates the site)
6	Posthole (post-dates the site)

To interpret this site, the mill complex was divided into a series of construction elements associated with one of two general aspects of the site: **Mill Structure** (e.g., brick foundation, east addition, concrete floor, brick floor, log foundation) or **Power System** (e.g., culvert, Penstock No. 1, wheelpit, turbine pit, wing walls, mill dam, headrace, and tailrace) (Table 9.2)

**Table 9.2**  
**Descriptive Characteristics of Excavated Construction Features**

Description	Location	Dimensions (ft) N/Sx E/W	Maximum Depth (ft)
Brick Mill Foundation	TU1, TU2, TU6, MT 6	26x24	4.1
Concrete Floor	TU1, TU5, TU6, J6, MT1, MT2, MT3	NA	2 – 3.9
Wood Plank Floor	TU1	3x8	4.1
Brick Floor	TU1, TU6	NA	2.5
East Mill Addition	East of Mill; TU3, 5; STPs T2-1 T3-2, Ja5, J8	16x20	2.5
Log Foundation	MT 1, MT2, MT5, and MT6	30x15.8	4.5 – 5
Wing Wall, north	Waterpower System (south of mill); CU1	14x1 (NW-SE)	3.5
Wing Wall, south	Waterpower System (south of mill); CU11	7x1 (NE-SW)	*NA
Penstock No. 1	Waterpower System (south of mill); CU1-20	10x28	1.8
Penstock No. 2	Waterpower System (south of mill); CU1-20	10X14	2.6
Penstock No. 3	Waterpower System (south of mill); CU1-20	12x12	3.2
Wheel Pit	Waterpower System (south of mill); CU7-8, CU17-18	11X23	2.8
Turbine Pit	Waterpower System (south of mill); CU17-18	7.5x9.5	2.1

\*NA = data not available (complete boundaries of feature not present)

Evidence of machinery mounts and supports were found within the mill foundation, east addition, and penstock area; therefore, they were incorporated into the discussion of these construction elements, where appropriate. The mill pond and mill dam were not impacted by the construction and are only mentioned briefly in this report.

During the course of fieldwork, individual vertical posts, horizontal beams, and planks were assigned unique numbers. A table of the wood construction members is included in Appendix B and shown on drawings included in this chapter. This numeric system facilitated the identification of structural members for dendrochronological analysis. For discussion purposes only, piers in the east addition were assigned unique numbers.

## Overview

The “late discovery” that began archeological investigations included a brick wall (mill foundation) exposed during construction activities. The mill foundation was of 19<sup>th</sup>-century origin and became the immediate focus of intensive excavations as archeologists attempted to determine the dimensions, integrity, and function of the foundation, and to ascertain the presence of additional associated cultural remains.

Through surface examination supplemented by soil probing and shovel testing, archeologists quickly defined the horizontal limits of the brick mill foundation (see Figure 9.1). Once the building “footprint” was determined, six test units were excavated in and around the foundation to define the integrity and vertical limits and the presence of associated structural remains and artifact deposits (Table 9.3). Shovel tests were excavated along a grid directly east of the brick foundation, in the area where the brick piers were observed during surface examination. Excavations identified six brick piers that likely represented a mid-19<sup>th</sup>-century addition to the mill.

**Table 9.3**  
**Description of Excavations**

Excavation	Quantity	Approx. Dimensions (ft) N/S x E/W	Depth (ft) of Excavation	Location
Judgmental STPs	8	1.5 x 1.5	1.1 – 2.8	Brick Mill Foundation and east addition
Systematic STPs	19	1.5 x 1.5	1.5 – 3.5	Brick Piers / Mill Foundation
Test Units	6	5 x 5	4.0 – 7.8	Brick Mill Foundation and east addition
Collection Units	20	10 x 5	3 – 8	Waterpower System
Machine Trenches	7	5 x 15 (average)	3 – 8	Mill Foundation / Log Foundation

Overall, excavations recovered 4,919 artifacts (Table 9.4), primarily comprised of architectural debris (76.8%) to include nails, brick and window glass, and kitchen artifacts (13.7%) that included bottles and ceramics dating to the mid-to-late-19<sup>th</sup> and early-20<sup>th</sup> centuries.

Features or construction elements identified during excavations pertained to Cubbage Mill operations (see Table 9.2) (i.e., a portion of the original late-18<sup>th</sup>-century log foundation, the mid-to-late-19<sup>th</sup>-century brick foundation, a mid-to-late-19<sup>th</sup>-century mill

addition, and several features associated with the waterpower system.) These latter features included two wing walls, a culvert, three penstocks, two possible turbine pits/platforms, and a waterwheel pit. A variety of other wood and brick concentrations related to the mill occupation were also identified and mapped at the site.

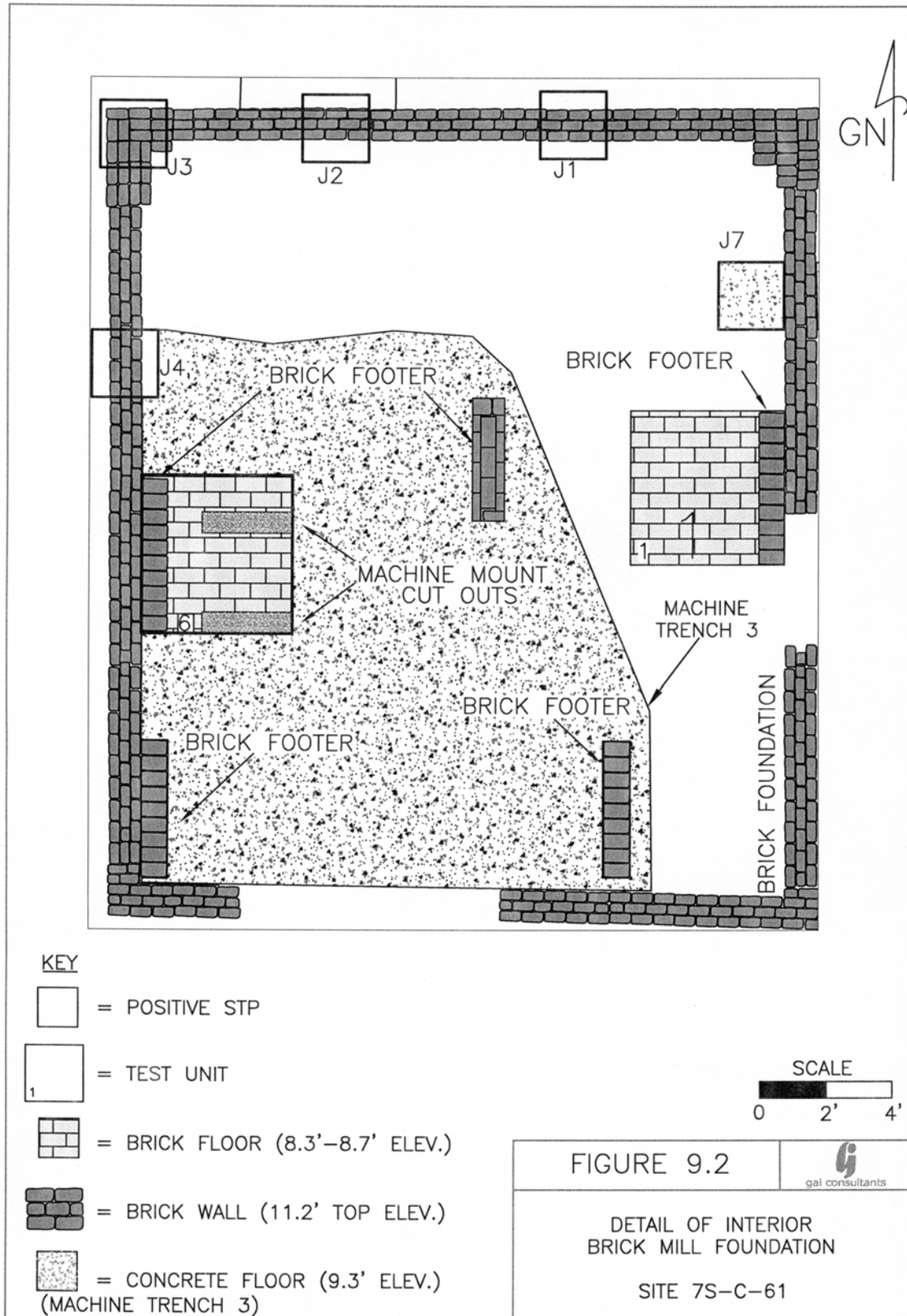
**Table 9.4**  
**Cross Tabulation of Excavation Type by Artifact Group**

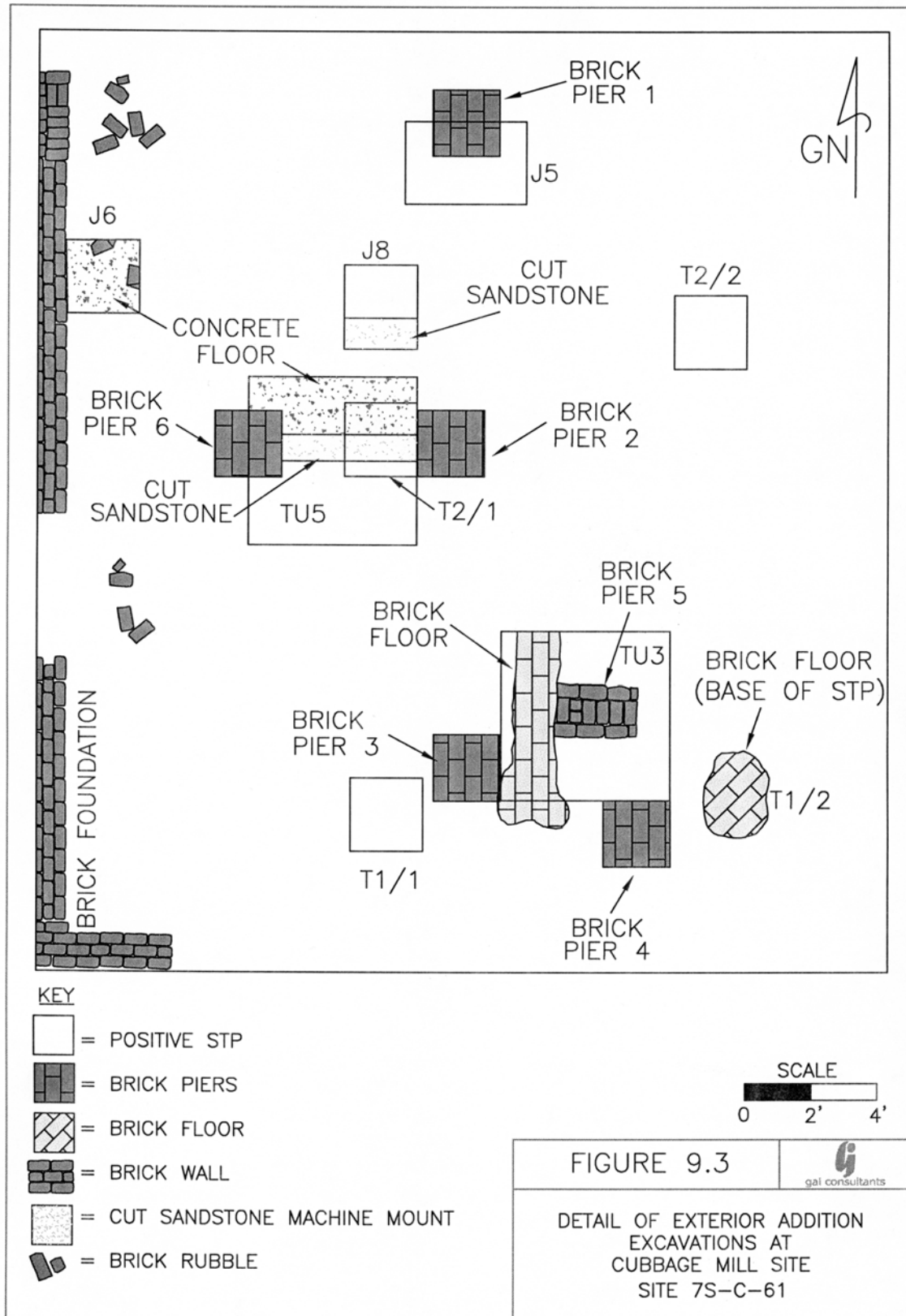
Functional Group	STP	JSTP	Test Units	Collection Units	Machine Trenches	General Provenience	TOTAL	% of Total
Kitchen	131	110	124	213	13	84	675	13.72
Architecture	501	709	1665	578	53	273	3779	76.82
Arms	-	1	2	-	-	-	3	0.06
Clothing	-	1	34	12	7	2	56	1.14
Furnishings	2	-	7	-	1	-	10	0.20
Personal	2	-	13	16	1	3	35	0.71
Activities	-	2	5	27	-	18	52	1.06
Tobacco Pipes	-	-	5	4	-	-	9	0.18
Faunal	3	3	13	-	14	-	33	0.67
Floral	-	-	27	2	-	-	29	0.59
Prehistoric	-	-	1	-	-	-	1	0.02
Unidentifiable	55	40	97	30	7	8	237	4.82
<b>TOTAL</b>	<b>694</b>	<b>866</b>	<b>1993</b>	<b>882</b>	<b>96</b>	<b>388</b>	<b>4919</b>	<b>100.00</b>
<b>% of Total</b>	<b>14.11</b>	<b>17.61</b>	<b>40.52</b>	<b>17.93</b>	<b>1.95</b>	<b>7.89</b>	<b>100%</b>	

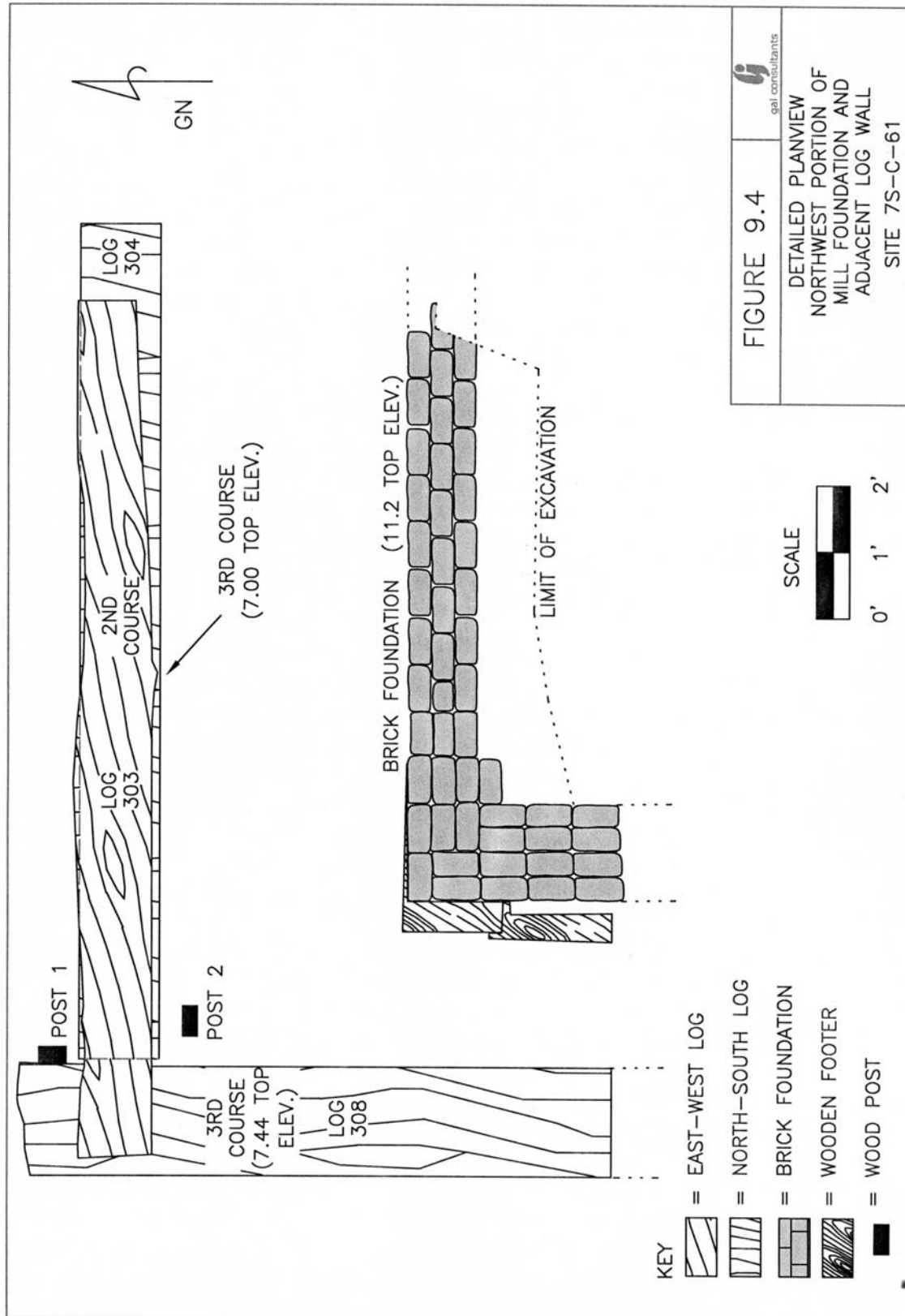
While excavations were ongoing, historians assembled pertinent documents that might shed light on the nature and age of the site and, in the process, better guide archeological investigations. A review of historic maps and records indicates that Site 7S-C-61 represents the remains of a late-18<sup>th</sup> to early-20<sup>th</sup>-century “custom” gristmill. Custom gristmills were small-scale businesses developed by local merchants with the specific purpose of serving area farmers by processing grains. As described in Volume I, the mill on Cubbage Mill Pond offered, for a time, both grist- and saw-milling services to the community, as evidenced by an 1868 tax assessment record that confirms both services in evidence within the area of the excavations.

### **Details of Excavations**

In all, excavations consisted of eight judgmental shovel test pits (JSTPs), 19 systematic standard-interval shovel test pits (STPs), six test units (TUs), seven machine trenches, and 20 collection units (CUs) (see Table 9.3). The nature and extent of archeological excavations are defined below. Three detailed plan view drawings show construction features for the brick mill foundation, east addition, and log foundation (Figures 9.2, 9.3, 9.4, respectively).









**Judgmental Shovel Test Pits (JSTP)**

GAI excavated eight JSTPs to delineate the margins of the brick foundation (see Figures 9.1 and 9.2), each being placed around the perimeter of the foundation or addition. JSTP soils were generally comprised of varying layers of loamy-sand fill intermixed with debris and historic artifacts ( $n=866$ ) comprised largely of architectural debris (81.9%) and kitchen items (12.7%) (Table 9.5). Diagnostic artifacts included cut ( $n=99$ ) and wire ( $n=12$ ) nails, and bottle glass ( $n=88$ ) dating from the early- to mid-19th through early-20th centuries. JSTPs were designated with the letter “J” and numbered consecutively in the order in which they were excavated (for example, “J3” is the third JSTP excavated).

**Table 9.5**  
**Cross Tabulation of Artifact Group by Judgmental STP**

JSTP	Kitchen	Architecture	Clothing	Arms	Faunal	Other	TOTAL
J1	-	100	-	-	2	27	129
J2	98	65	-	-	-	10	173
J3	-	-	-	-	-	-	0
J4	-	6	-	-	-	-	6
J5	-	300	-	-	-	-	300
J6	-	11	-	-	-	2	13
J7	12	1	-	-	-	-	13
J8	-	226	1	1	1	3	232
TOTAL	110	709	1	1	3	42	866
%	12.70	81.87	0.12	0.12	0.35	4.85	100%

JSTP excavations successfully traced the boundaries of the mill and its addition, while providing information that would facilitate efficient placement of test units. J1 and J2 were excavated atop the northern wall of the brick foundation revealing a two-course bond of three approximately 1.5-foot-wide parallel stretcher courses (see Figure 9.2; Photograph 9.2). Mortar was used to seat the bricks into place. An intact northwestern corner of the foundation was uncovered in J3, prompting the excavation of J4 approximately 5 feet south along the western foundation wall.



**Photograph 9.2**

***J1 along Northern Edge  
of Cubbage Mill Brick  
Foundation.***



Located directly south of the northernmost brick pier (Pier 1), J5 encountered a buried Ab horizon (Figure 9.5) approximately 0.75-foot below ground surface (bgs), in conjunction with a significant increase in artifacts and burned wood fragments. This buried Ab horizon likely represents an historic ground surface present at the time of mill operation.

J6 and J7 were excavated on the exterior and interior eastern walls of the brick foundation, respectively (see Figure 9.1), approximately eight feet south of the northeastern corner. Excavated within the interior of the brick foundation, J7 terminated on the surface of a concrete floor, approximately one foot below modern grade (see Figure 9.2). The same floor was observed at a similar depth in J6 (located on the exterior of the main structure foundation), but was still within the east building addition as defined by the brick piers (see Figure 9.3). The concrete floor indicates that these brick piers were footings for an addition east of the main mill building. J8, excavated near a brick pier (Pier 2) to document the extent of the eastern addition also documented the presence of a cut-sandstone footer (see Figure 9.3).

### **Shovel Test Pit Excavations**

Through Phase I shovel test pit excavations, archeologists exposed portions of brick floors or foundation alignments. Subsurface testing to the south indicated that the construction of Road 214 had destroyed substantial portions of the southern wall of the mill foundation.

Shovel test pits ( $n=19$ ) were excavated along an east-west grid at 10-foot intervals to better define the brick mill foundation, explore the area with visible brick piers, and determine site limits along the eastern portion of the site (see Figure 9.1). STPs are designated by transect number/STP number (e.g., T1/3 is the third STP excavated in Transect 1).

Systematic STPs recovered 694 artifacts, largely comprised of architectural (72.2%) and kitchen (18.9%) debris (Table 9.6). As expected, a slightly higher percentage of kitchen debris was recovered in the area of the mill addition and adjacent yard. Of the 694 artifacts collected from systematic STPs, several were temporally diagnostic; Post-1915 artifacts consisted of assorted household bottles, including a syrup bottle and a perfume/cologne bottle, while pre-1880 artifacts included cut nails ( $n=10$ ) and assorted datable glass ( $n=29$ ).

Located approximately 1.5 feet west of a brick pier (see Figure 9.3, Pier 4), T1/1 contained the buried historic land surface (buried Ab horizon; see Figure 9.6) first observed in J5. Situated 10 feet to the east, T1/2 exposed a brick feature consisting of three parallel stretcher courses oriented northeast/southwest (see Figure 9.3). Measuring approximately 1.5 feet in width, and conspicuously off-line with the adjacent brick pier and eastern mill foundation wall, the bricks may represent the remains of a walkway that skirted the mill, a foundation associated with an unidentified structure pre-dating the addition, or footers for machinery. No features were identified in T1/3 (located to the east), which was terminated at 1.4 feet below modern grade due to standing water.

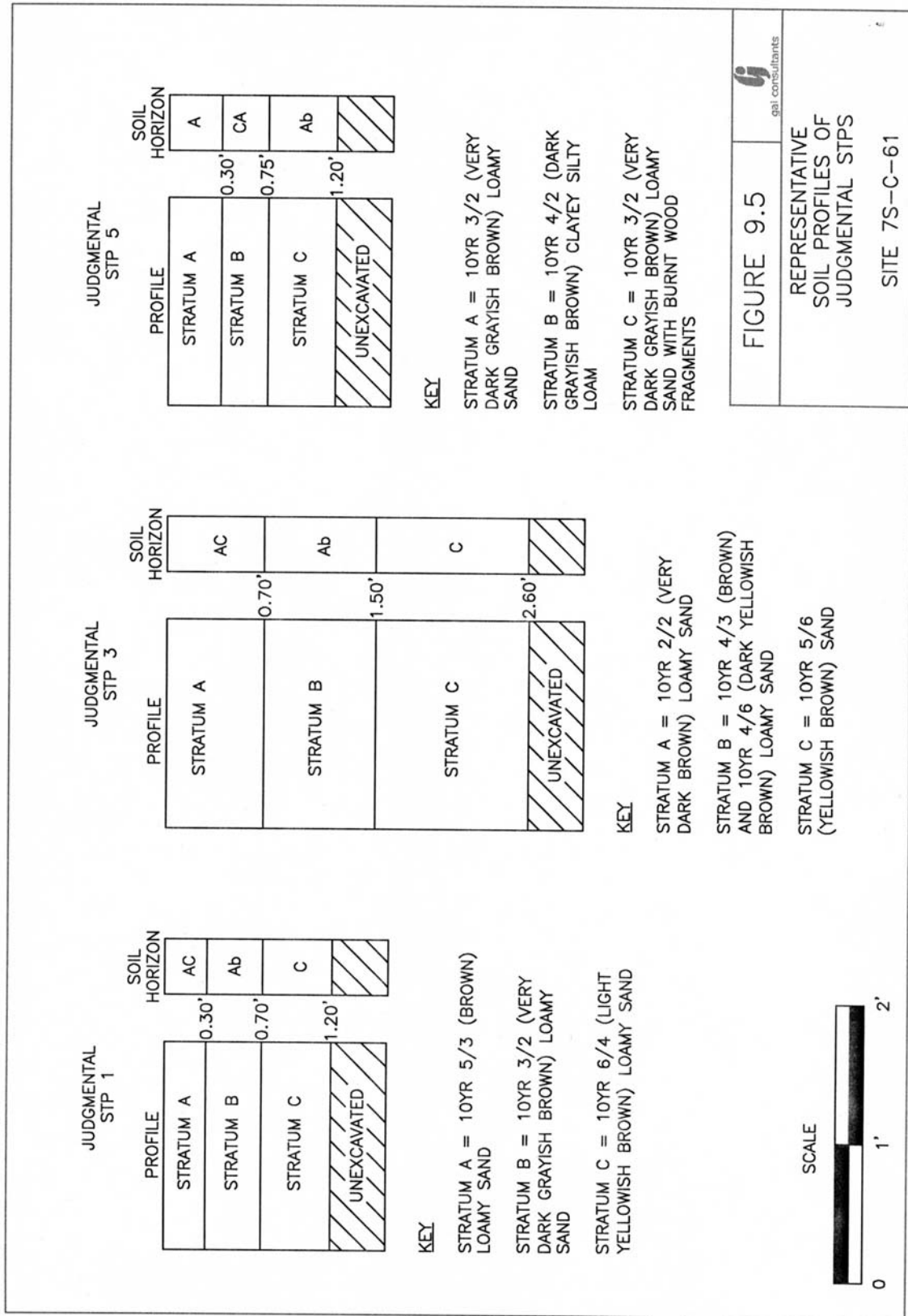


Table 9.6

## Cross Tabulation of STPs by Artifact Group

Transect/STP #	Kitchen	Architecture	Furnishings	Personal	Faunal	Unidentifiable	TOTAL
T1/1	--	2	--	--	2	--	4
T1/2	--	1	--	--	--	--	1
T1/3	--	--	--	--	--	--	--
T2/1	--	5	--	--	--	14	19
T2/2	--	37	--	--	--	--	37
T2/3	--	26	--	--	--	4	30
T3/1	7	59	--	2	--	17	85
T3/2	--	10	--	--	--	2	12
T3/3	31	13	--	--	1	--	45
T3/A	90	131	--	--	--	6	227
T4/1	--	--	--	--	--	4	4
T4/2	--	5	--	--	--	--	5
T4/A	--	47	--	--	--	--	47
T5/A	--	52	--	--	--	2	54
T5/B	--	36	2	--	--	--	38
T6/A	--	19	--	--	--	6	25
T6/B	--	50	--	--	--	--	50
T7/B	--	--	--	--	--	--	--
T7/C	3	8	--	--	--	--	11
TOTAL Count	131	501	2	2	3	55	694
TOTAL %	<b>18.9</b>	<b>72.2</b>	<b>0.3</b>	<b>0.3</b>	<b>0.4</b>	<b>7.9</b>	<b>100%</b>

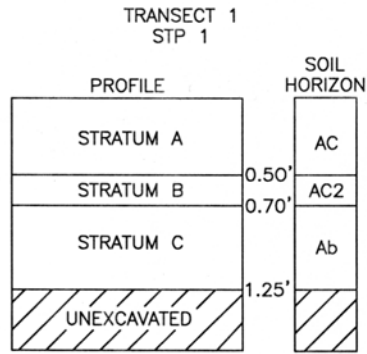
Situated directly west of Pier 2 (see Figure 9.3), T2/1 identified a cut-sandstone footer on a concrete floor with elevations between 0.4 and 0.7-foot bgs (Photograph 9.3). No features were encountered in T2/2 and T2/3 placed further to the east, although architectural debris was recovered in each (see Table 9.6). T3 contained four STPs generally aligned on an east-west axis with the northern brick foundation wall (see Figure 9.1). T3/1, T3/2, and T3/3 produced relatively uniform profiles composed of dark gray-brown topsoil overlaying the historic buried A soil and B horizons (Figure 9.6). No additional structural remains were identified in T3.

*Photograph 9.3*

*Planview, Sandstone Footer  
T2/1 (scale rests on brick Pier*



REPRESENTATIVE SOIL PROFILES

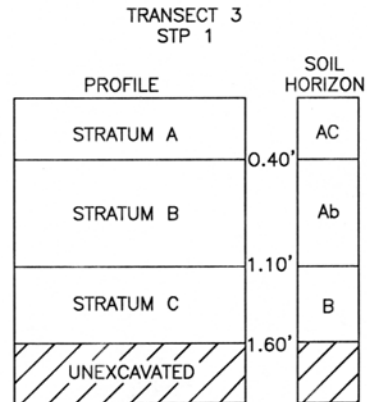


KEY

STRATUM A = 10YR 2/2 (VERY DARK BROWN) SANDY LOAM

STRATUM B = 10YR 5/8 (YELLOWISH BROWN) SANDY LOAM

STRATUM C = 10YR 5/2 (GRAYISH BROWN) LOAMY SAND



KEY

STRATUM A = 10YR 3/2 (VERY DARK GRAYISH BROWN) LOAMY SAND

STRATUM B = 10YR 4/2 (DARK GRAYISH BROWN) LOAMY SAND

STRATUM C = 10YR 6/4 (LIGHT YELLOWISH BROWN) LOAMY SAND

SCALE

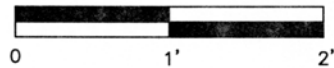


FIGURE 9.6

REPRESENTATIVE SHOVEL TEST  
PROFILES SYSTEMATIC STPS  
TRANSECTS 1-3

SITE 7S-C-61

No structural remains or historic buried soils were observed in T4/A, T4/1 and T4/2, T5/A, T5/B, T6/A, T6/B, T7/B or T7/C (Figure 9.7). Shovel test pits in these four transects revealed sandy loam fill deposits with small amounts of historic and structural debris, but did not reveal features.

### **Test Unit Excavations**

Following the excavation of judgmental and systematic STPs, six 5x5-foot test units (TU1 through TU6) were placed at select locations to delineate the boundaries of the mill and its eastern addition more clearly (see Figure 9.1). Test units were excavated to collect controlled samples of artifacts and to carefully record site stratigraphy. The excavation of test units at Site 7S-C-61 was undertaken as part of both Phase II and Phase III investigations. As described below, TU1 and TU6 were excavated within the interior of the mill along the eastern and western foundation walls, respectively. TU2 was excavated on the exterior of the northern brick foundation wall. TU3 and TU5 were excavated in the vicinity of the brick piers, approximately 10 to 15 feet east of the eastern foundation wall. Finally, TU4 was excavated approximately 30 feet northeast of the northeastern corner of the brick foundation.

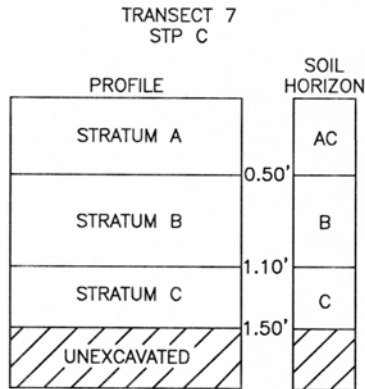
Each test unit measured 5 feet square and was excavated manually according to observed natural and cultural stratigraphy. Soils were generally excavated in 0.3-foot arbitrary levels within defined soil strata. To promote the recovery of artifacts, excavated soils from undisturbed contexts were screened through one-quarter-inch hardware mesh. Soils were evaluated for composition and described according to the Munsell color system. Each test unit is described below, with the discussion focused on feature identification. Specific soil strata are described in the associated figure profiles, while artifact tabulations are presented in Tables 9.7 and 9.8.

**Table 9.7**  
**Descriptive Characteristics of Test Units and Artifacts**

Test Unit	Strata (count)	Depth below grade (ft.)	Features Identified	Artifacts	% of Total
1	A-G (7)	7.8	1, 2, 3, and 4	271	13.60%
2	A-E (5)	4.8-5.1	1	323	16.21%
3	A-I (9)	4.3	Mill Addition	405	20.32%
4	A-G (7)	4.0	--	358	17.96%
5	A-D (4)	4.0	Mill Addition	552	27.70%
6	A-H (8)	4.9	1, 2, and 4	84	4.21%
<b>TOTAL</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>1993</b>	<b>100.00</b>

Excavation of TU1 and TU6 was designed to uncover structural features associated with the construction of the mill and to discern soil strata that might clarify its temporal association and use (see Figure 9.2). TU1 was located along the interior of the east brick-foundation wall near J6 and J7 (see Figure 9.2). Seven soil strata (Strata A-G) and four archeological features (originally designated as Features 1, 2, 3, and 4) were identified in the course of excavating TU1 (Figure 9.8).

REPRESENTATIVE SOIL PROFILES

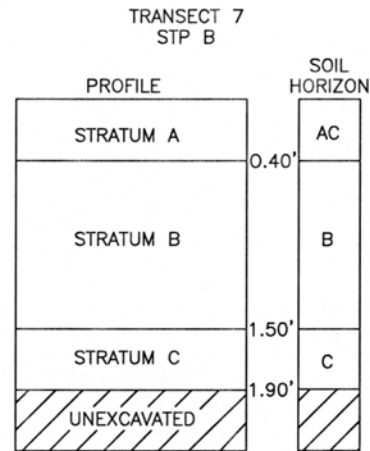


KEY

STRATUM A = 10YR 4/3 (BROWN)  
SANDY LOAM

STRATUM B = 10YR 5/3 (BROWN)  
SANDY LOAM

STRATUM C = 10YR 6/3 (PALE  
BROWN) AND 10YR 7/6 (YELLOW)  
SAND



KEY

STRATUM A = 10YR 4/3 (BROWN)  
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STRATUM C = 10YR 6/3 (PALE  
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SAND

SCALE

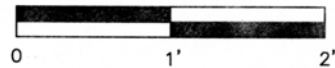


FIGURE 9.7

REPRESENTATIVE SHOVEL TEST  
PROFILES, SYSTEMATIC STPS,  
TRANSECTS 4-7

STIE 7S-C-61



**Table 9.8**  
**Cross Tabulation of Test Units by Artifact Group**

Test Unit	Kitchen	Architecture	Clothing	Personal	Faunal/Flora	Other	TOTAL COUNT	TOTAL %
1	7	216	11	11	15	11	271	15%
2	12	293	3	1	9	5	323	18%
3	1	197	0	0	0	3	201	11%
4	14	297	6	2	1	38	358	20%
5	67	430	3	3	1	48	552	31%
6	9	51	11	0	12	1	84	5%
TOTAL COUNT	110	1484	34	17	38	106	1789	100%
TOTAL %	6%	83%	2%	1%	2%	6%	100%	

It should be noted that the brick foundation wall terminated partway into the east wall in what appeared to an opening for ventilation or doorway (Photograph 9.4). Below Stratum A, excavation of TU1 identified a concrete floor abutting the brick foundation wall. The concrete floor spanned the entire unit and was underlain by black, organic, sandy loam (largely decomposed vegetation). Three window glass sherds and three unidentifiable nails were recovered from the dark sediment (Stratum B).



*Photograph 9.4*

*A Brick Foundation in TU1,  
showing Gap for Doorway.*

Excavation of Stratum C revealed an underlying dark-gray sand encompassing a protruding wooden plank that may represent a floor, and charcoal from a burning episode. The plank was located along the southern balk with numerous brick fragments, and charcoal flecks. The excavation of Stratum C produced a small assemblage of late-19<sup>th</sup>-century artifacts (one bottle finish, two window glass pieces, brick fragments, and nine cut nails). This burning episode, originally designated as Feature 3 (or Stratum C) was shallow, measuring approximately 0.1-foot in depth.

Archeologists removed Stratum D-1, light olive-brown sand, revealing a loosely configured brick floor at a depth of 2.5 feet to 2.8 feet below datum (Photograph 9.5; see Figure 9.8). This floor was composed of a single course of bricks abutting a brick footer that was adjacent to the brick foundation wall on the east balk (see Figure 9.2). The floor was articulated with assorted full and half bricks extending across the unit. Several burned cut nails and burned wood fragments were collected from atop the floor.

**Photograph 9.5**

**Brick Floor, TU1, Stratum D-1.**  
**Note brick footer along the left**  
**side of the excavations.**



In an attempt to define deeper strata and additional structural features, archeologists recorded and then removed the brick floor (Stratum E-1). Artifact yields increased demonstrably beneath the floor with the recovery of 14 window glass fragments, nine cut nails, four leather fragments, and a white ball-clay pipe fragment from Stratum E-1. Wood chips and splinters were observed throughout the level. One should note that while cutting timber at a sawmill *would not* typically produce chips and splinters, a turning

lathe *would* produce such waste products. The insurance records discussed in Volume I indicated that the mill had two circular saws and two turning lathes in 1868. Therefore, it appears that there is evidence of the sawmill activities beneath (i.e., pre-dating) the brick floor.



The artifacts indicated that the brick floor was built mid-19<sup>th</sup> century; this date is further supported by the fact that the brick foundation wall rests atop a wooden sill that was milled with a circular saw--a technological development that is generally dated between 1850 and 1860 (Photograph 9.6).

**Photograph 9.6**

**Bottom of TU1, showing Wood Sill Milled by**  
**Circular Saw. Looking East.**

Below the brick-paved floor, Stratum E-3 revealed additional remains of brick, wood, and wooden splinters (Photograph 9.7). Two wooden planks (trending east-west) were observed in the northern half of TU1, suggestive of an underlying wood floor. Archeologists also noted wood shavings at the base of Stratum E-4.



*Photograph 9.7*

*Possible Flooring Plank, TU1,  
Stratum E.*

The excavation of TU1, Strata F and G, revealed low artifact densities, no features, and extremely wet conditions caused by continued water seepage into the base of the unit. Soil probes recorded beneath Stratum G-1 revealed sterile sand levels with no cultural inclusions. As a result of unit conditions and yields, the excavation of TU1 was terminated after excavation of Stratum G-1.

The east profile of the unit displayed several interesting construction elements. First, it appeared that the east brick foundation had an opening built into the foundation (see Photograph 9.4). This may have served either as a doorway opening or for ventilation. Second, there was a brick footer placed along the interior of the foundation (see Photograph 9.5; Figure 9.8). The exposed footer rested on the floor, was five feet long (length of the east unit wall) and 0.8 ft wide, and two to three courses higher than the floor. The brick foundation wall was built atop a wood beam, which served as a sill and rested on a wood pier (a large wood block and a plank). This beam was milled with a circular saw—a technological development that is generally dated between 1850 and 1860 (see Photograph 9.6). This sill would have helped stabilize the foundation in the unconsolidated wet sandy soil matrix found at this location.

Test Unit 6 (TU6) was located on the interior aspect of the western mill foundation wall (see Figure 9.1). Located roughly due west of TU1, eight soil strata (Strata A through H) were identified in the course of excavating TU6 and were keyed to strata encountered in nearby TU1. TU6 excavation provided additional information regarding the mill foundation, concrete floor, and brick floor—each of which was first identified in TU1 (Figure 9.9).

TU6 similarly revealed information on construction episodes associated with the mill. TU6 also had a brick footer (two courses deep, one course wide, and ran the length of the unit (5 ft) along the foundation wall) (see Figure 9.9). Excavations also confirmed the presence of a wood sill below the brick foundation, as in TU1. After removal of the brick floor, Stratum E revealed sawdust and cut wood shavings. The sawdust and the wood shavings indicated the presence of both a circular saw and a wood lathe in this vicinity. It should be noted that the saws and lathes would be located on the first floor; however, the waste (sawdust and shavings) could easily fall down onto the basement floor. Identification of two probable anchor bolts, one protruding from the brick floor, and one protruding from the footer, likely indicates the location of machine mounts where the floor was built around machinery. There were two rectangular openings cut into the brick floor that may also have been associated with anchoring equipment. Excavation of TU6 was terminated upon encountering water at nearly 5 feet below grade.

Pattern analysis of artifacts from TUs 1 and 6 on the interior of the brick mill foundation reflects the non-domestic function of the structure (Table 9.9).

**Table 9.9**  
**Pattern Analysis of Artifacts from TUs 1 and 6, Mill Foundation Interior**

Artifact Group	Count	Percentage
<b>KITCHEN</b>		
Ceramics	9	2.54
Bottles	2	0.56
Tableware	4	1.13
Kitchen – Other	1	0.28
<b>Kitchen Subtotal</b>	<b>16</b>	<b>4.51</b>
<b>ARCHITECTURAL</b>		
Nails, spikes, etc.	68	19.15
Window glass	71	20.00
Brick, block	31	8.73
Mortar, cement	24	6.76
Misc. building materials	58	16.34
Wood	8	2.25
Misc. small hardware	3	0.85
Other architectural	4	1.13
<b>Architectural Subtotal</b>	<b>267</b>	<b>75.21</b>
<b>CLOTHING</b>		
Clothing fasteners	3	0.85
Shoes	12	3.38
Belts, straps	7	1.97
<b>Clothing Subtotal</b>	<b>22</b>	<b>6.20</b>
<b>PERSONAL</b>		
Ornamental	8	2.25
Tobacco Pipes	4	1.13
<b>Personal Subtotal</b>	<b>12</b>	<b>3.38</b>
<b>FAUNAL / FLORAL</b>		
Faunal	9	2.54
Other floral	18	5.07
<b>Faunal/Floral Subtotal</b>	<b>27</b>	<b>7.61</b>
<b>PREHISTORIC LITHIC</b>	<b>1</b>	<b>0.28</b>
<b>UNIDENTIFIABLE</b>	<b>10</b>	<b>2.82</b>
<b>TOTAL</b>	<b>355</b>	<b>100%</b>



Architectural debris, including nails, window glass, brick, mortar/cement, and wood, comprise over 75 percent of the debris. Clothing (fasteners, shoes, and belts) and kitchen (ceramics, bottles, and tableware) artifacts account for 6.2 percent and 4.5 percent of TU1 and TU6 artifacts.

TU2 was located just outside the north brick-foundation wall, adjacent and south of an earlier log foundation (see Figure 9.1). Five soil strata (Strata A-E) were identified in TU2 (Figure 9.10). Stratum A (uppermost) was composed of recent overburden fills associated with previous road construction and trash deposition at the site.

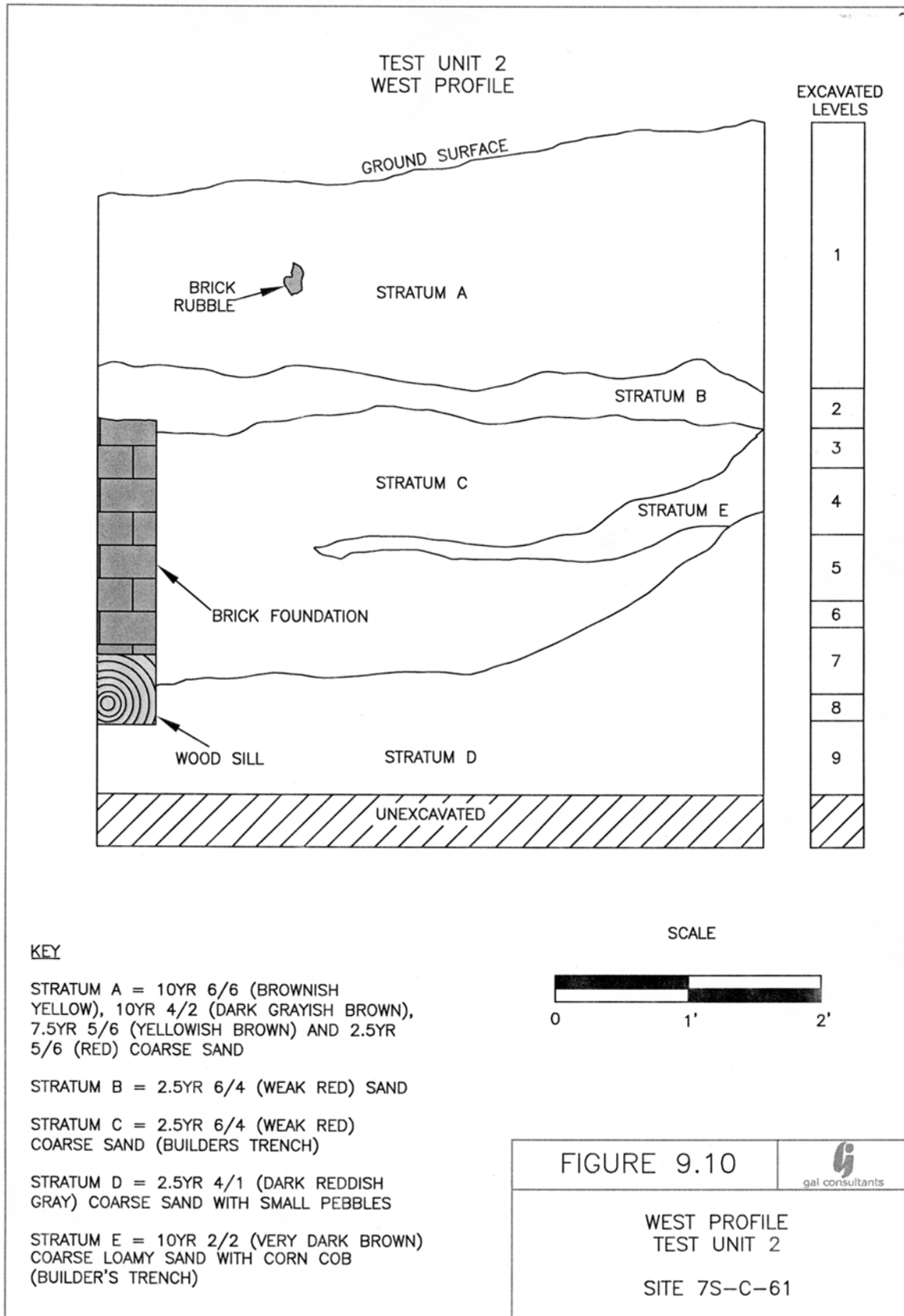
Measuring approximately 2 feet in depth, Stratum A was excavated manually, without soil screening. Archeologists observed numerous modern artifacts throughout Stratum A, including clear window and bottle glass, and wire nails. In the course of excavating Stratum B-1, the intact upper portion of the brick foundation of the mill structure was exposed along the entire southern edge of TU2.

Stratum B-1 produced a small assemblage of artifacts (brick fragments, unidentifiable glass and nails, and one cut spike). Underlying levels were inundated by water and revealed low artifact densities in Strata B, C, and D. Strata C and E are associated with a builder's trench. Stratum D, which was approximately 5 feet deep, produced a single cut nail and a sherd of embossed ironstone ceramic dated ca. 1890 (Appendix C, Artifact Catalog).

TU3 (Photograph 9.8) and TU5 were adjacent to piers observed at the ground surface, approximately 15 feet east of the brick mill foundation (see Figure 9.1 and Figure 9.3). Designed to identify the nature and extent of the mill's addition, TU3 revealed nine soil strata (Strata A through I). Below Stratum C-1 (Figure 9.11), approximately one foot below modern grade, a one-and-a-half course, 1-foot-wide, brick foundation of three parallel stretchers was identified, trending north-south.



***Photograph 9.8***  
***GAI Archeologists Expose***  
***Brick Feature, Test Unit 3.***  
***Looking South.***





A short east-trending support construction feature of whole and partial brick was observed in the approximate center of TU3, perpendicular to the brick foundation. Although designated as Pier 5, this feature was less uniform in construction than Piers 1-4 and Pier 6 (see Figure 9.3; Photograph 9.9). Artifacts generated from C-1 included clear window and lamp-chimney glass, brick fragments, unidentified metals, and various cut nails circa 1860s to 1890s.

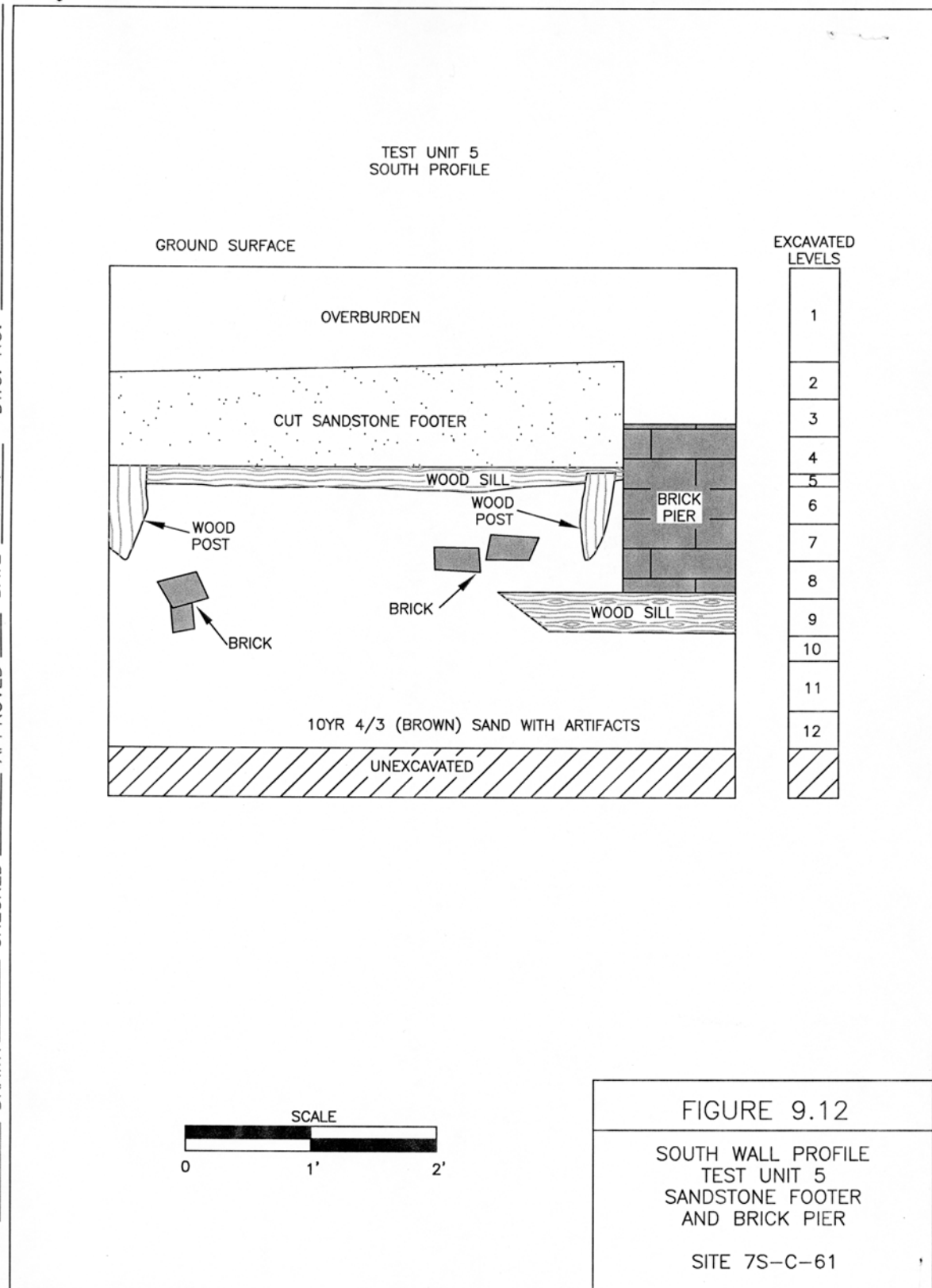
Excavation of Stratum C-2 revealed that Pier 5 (observed in Stratum C-1) appeared to form a buttressing pier of incomplete wall foundation trending east. Artifacts generated from Stratum C-2 include various bottle and opaque glass sherds. The soil and brick in this stratum indicated that a builder's trench was located on the west side of the north-south foundation wall. Also, within TU3, Stratum E-1 revealed substantial brick rubble that may indicate the remains of earlier building episodes at the site, pre-dating the addition represented by brick piers.

***Photograph 9.9***

***Brick Feature Observed in TU3,  
Stratum E-1. Looking South.  
Note Pier 4 in upper left corner  
of unit, and Pier 3 on the upper  
right side of the unit.***



Test Unit 5 (TU5), approximately 5 feet east of the eastern foundation wall, was adjacent to brick Pier 2 and associated with the same structure addition revealed in TU3 (see Figure 9.3). Four soil strata (Strata A-D) were identified in the course of excavating TU5. At the terminal depth of Stratum A, approximately 0.5 feet below modern grade, archeologists uncovered the remains of a one-foot-square brick pier articulated with a cut-sandstone footer measuring approximately 0.5-foot (6 inches) in width (Figure 9.12). A concrete floor was observed on the north side of the sandstone footer and extending to the north balk. The concrete floor was recorded and removed as a means to excavate underlying soils and possibly define previous mill construction episodes. The concrete “floor” was 2-3 inches thick on the south end and 3 feet on the north end (approximately 3 feet between north and south), and abutted the cut sandstone footer. A second cut sandstone footer was identified in nearby J8 (see Figure 9.3). The concrete floor was sealing brown sand (10YR4/3) identified as Stratum B. Of structural interest, three abutting vertical planks, variously measuring from 0.5 to 0.75-foot (6 to 9 inches) in width, were observed on the eastern aspect of the north balk profile. Archeologists were not able to determine whether the planks served as concrete forms or represent the remains of a wooden partition or wall.



Various wood elements were observed at the base of Stratum B. Numerous cut nails, in combination with a white ball-clay pipe fragment, a sherd of American gray stoneware, and a sherd of Albany-type stoneware, confirm the 19th-century occupation and use of the property. Final unit profiles illustrate that the brick pier and the cut-sandstone footer were each underpinned with a wooden sill (see Figure 9.12; Photograph 9.10).



**Photograph 9.10**

***Profile of TU5 Showing the Underpinning of the Brick Pier and Cut-sandstone Footer. Looking Southeast.***

As observed in the brick foundation, wood sills and posts were routinely used at the site to offset problems associated with saturated soils and building subsidence.

TU4 was located in the vicinity of T4/2, approximately 20 feet northeast of the historic mill foundation (see Figure 9.1). Following shovel test results, TU4 was intended to uncover additional remains related to the discovery of a possible brick-and-mortar foundation identified at this location. Preliminary probing and shovel testing confirmed the presence of dense brick rubble approximately one foot below modern grade.

The uppermost stratum produced an assemblage of modern artifacts, including clear and amber bottle glass and plastic fragments. Stratum B, a homogeneous, brown sandy loam, was excavated in three 0.3-foot arbitrary levels. Measuring approximately one foot in depth, Strata B-1, B-2, and B-3 produced increasing numbers of demolition debris, including window glass and numerous cut nails and spikes.

Domestic artifacts recovered from Stratum B included numerous unidentifiable bottle glass sherds, one whiteware ceramic sherd (post-1815), and one course earthenware sherd. Despite the homogeneous, almost sterile appearance of near-basal Stratum F soils, various demolition materials were recovered during excavations. Excavation of underlying Stratum G, approximately 4 feet below modern grade, revealed a secondarily deposited wood plank measuring approximately one foot in width. No foundation was encountered, but the dense rubble found in TU4 may indicate the former location of an outbuilding.

As with TUs 1 and 6 inside the brick mill foundation, pattern analysis of artifacts from TUs 3, 4 and 5 (east of the mill) confirm the dominance of architectural artifacts, as one would expect from a ruined structure (Table 9.10). Architectural debris, including nails, window glass, brick, mortar/cement, and wood, comprise about 84% percent of the assemblage from this area. Kitchen items (ceramics, bottles, and tableware) account for about 7% of these artifacts. Other artifacts include assorted clothing (fasteners and shoes;  $n=9$ ), arms ( $n=2$ ), personal items ( $n=3$ ), tobacco pipes ( $n=2$ ), and unidentifiable faunal remains ( $n=2$ ).

**Table 9.10**  
**Pattern Analysis of Artifacts from TUs 3, 4, and 5, Area of Mill Addition**

Artifact Group	Count	Percentage
<b>KITCHEN</b>		
Ceramics	8	0.61
Bottles	83	6.31
Tableware	2	0.15
Kitchen – Other	3	0.23
<b>Kitchen Subtotal</b>	<b>96</b>	<b>7.30</b>
<b>ARCHITECTURAL</b>		
Nails, spikes, etc.	513	39.01
Window glass	250	19.01
Brick, block	46	3.50
Mortar, cement	10	0.76
Misc. building materials	184	13.99
Plumbing	20	1.52
Plumbing	20	1.52
Door parts	4	0.30
Heating	8	0.61
Belts, straps	2	0.15
Misc. small hardware	2	0.15
Other architectural	69	5.25
<b>Architectural Subtotal</b>	<b>1108</b>	<b>84.26</b>
<b>FURNISHINGS: lighting</b>	<b>7</b>	<b>0.53</b>
<b>ARMS</b>	<b>2</b>	<b>0.15</b>
<b>CLOTHING</b>		
Clothing fasteners	4	0.30
Shoes	5	0.38
<b>Clothing Subtotal</b>	<b>9</b>	<b>0.68</b>
<b>PERSONAL</b>		
Hygiene	1	0.08
Other activities	1	0.08
Perfume/cologne	1	0.08
<b>Personal Subtotal</b>	<b>3</b>	<b>0.23</b>
<b>TOBACCO PIPES</b>	<b>2</b>	<b>0.15</b>
<b>FAUNAL</b>	<b>4</b>	<b>0.30</b>
<b>UNIDENTIFIABLE</b>	<b>84</b>	<b>6.39</b>
<b>TOTAL</b>	<b>1315</b>	<b>100%</b>

### Machine Trenches (MT)

To expedite exposure of the brick mill foundation and to facilitate identification of other structural features associated with the foundation, seven machine trenches (of various sizes) were excavated at Site 7S-C-61 (Photograph 9.11; see Figure 9.1; Table 9.11). Fifty-gallon soil samples were extracted from each machine trench excavated at Site 7S-C-61. Screening soil samples through ¼-inch mesh revealed 97 artifacts (Table 9.12), most of which were architectural debris. Diagnostic artifacts included beer bottle glass ( $n=6$ , 1903-present), whiteware ( $n=7$ , 1815-present), and cut nails ( $n=2$ , 1880-present).

**Photograph 9.11**

*Excavation of MT3, revealing Cubbage Mill's Western Foundation Wall. Looking West, toward Cofferdam.*



**Table 9.11**

**Machine Trenches, Results of Excavations**

Machine Trench #	Size (ft) (N/S / E/W)	Depth below Surface (ft)	Artifact Count	Features Identified
MT1	3 x 10	3.19	12	Brick foundation; log foundation
MT2	4 x 14	3.75	68	Brick foundation; log foundation
MT3	16 x 20	6.46	-	Brick foundation; west wall, interior plan
MT4	4 x 15	~ 7.0	-	Brick foundation; remnant, southern wall, penstock
MT5	5 x 10	~ 6.0	10	Brick foundation; log foundation
MT6	5 x 10	~ 7.0	-	Brick foundation; log foundation
MT7	3 x 14	~ 6.8	7	None

**Table 9.12**

**Cross Tabulation of Artifact Groups and Trenches**

Machine Trench #	Kitchen	Architecture	Clothing	Faunal	Furnish.	Personal	Activities	Other	TOTAL
MT1	-	11	-	-	1	-	-	-	12
MT2	12	34	=	14	-	1	-	7	68
MT3	-	-	-	-	-	-	-	-	0
MT4	-	-	-	-	-	-	-	-	0
MT5	-	3	7	-	-	-	-	-	10
MT6	-	-	-	-	-	-	-	-	0
MT7	1	5	-	-	-	-	1	-	7
TOTAL	13	53	7	14	1	1	1	7	97

MT1, excavated approximately five feet south of J4, confirmed the continuation of the western foundation wall and concrete floor to the south, also observed in J7. MT2, located approximately five feet south of MT1, was similarly excavated to confirm the presence and extent of the western foundation wall and concrete floor. MT1 and MT2 were excavated perpendicular to the brick foundation and exposed part of the log foundation structure. MT3 was designed to expose extensive portions of the western foundation wall toward the southwestern corner of the structure (Photograph 9.12).

**Photograph 9.12**

***Western Foundation Wall to Cubbage Mill, as Exposed in MT3. Looking Southwest. Note interior concrete floor.***



MT3 was excavated parallel to the western foundation wall, exposing both a significant portion of the foundation and interior of the structure (see Figure 9.2). In addition, to exposing the concrete floor, it also exposed several footers that may have served as machinery supports.

MT4 was excavated on the north side of the roadway culvert to determine if elements of the southern foundation wall were intact and to determine the nature and extent of mortised beams observed on the south side of the culvert. Careful excavation of MT4 facilitated the subsequent removal of overburden to expose the remains of the waterpower system completely in this portion of the site.

MT5 was originally excavated on the north side of Test Unit 2 as a means to drain water away from the brick mill foundation (see Figure 9.1). The profile of this trench exposed a 0.5-foot-thick sawdust layer extending for at least 7.0 ft east of TU2. The sawdust layer had an average elevation of about 9.5 ft. This sawdust concentration is a good indication that at least one of the circular saws was near the northeast end of the mill. In most gristmill-sawmill combinations, the sawmill is usually located on the first floor, and the foundation remains would be considered part of the basement level.

Beneath the sawdust was a layer of light gray sand overlying wood. The wood was discovered to be a mortised beam and several logs oriented parallel to the northern brick foundation wall. Archeologists surmised that these corner-timbered logs were structural remains associated with an earlier, ca. 1800-1802, mill foundation. The log foundation would pre-date the sawmill component of the mill, which was likely added in the late 1850s or early 1860s.



MT6 was excavated perpendicular to MT5 as a means of further exposing the log foundation (Photograph 9.13). In the process, five vertical courses of these foundation logs were observed approximately three feet west and parallel to the western brick foundation wall (Photograph 9.14). The horizontal relationship between the log foundation and the brick mill foundation is illustrated in Figure 9.4.



***Photograph 9.13***

***East Profile of Machine Trench 6, Showing the Exposed Western Brick Foundation and Log Foundation in Foreground.***

*Note Plank Cribbing Remnants along the Brick Foundation near the southwestern corner. This construction element would have provided extra measures to protect the foundation from Cabbage Pond floodwaters. Also, note the brick or masonry piers for the wood sill beams and brick “nogging” under sill beam on left.*

***Photograph 9.14***

***Exposed Portion of the Northwest Corner of the Brick Mill Foundation, Trenches 5 and 6. Looking West. Note log foundation, center and right.***

Exposing the long section between the logs and brick mill foundation revealed additional construction details about the mill foundation. The brick foundation rests on a series of horizontal beams, which served as a sill, and these beams were set on piers



as was identified in other excavations. MT 6 revealed that brick was used as “nogging” to fill in the gap beneath the sill between the masonry and wood piers. It appears that the nogging was added at a later date to provide additional stability to the foundation. In addition, a 2-foot-wide builder’s trench was identified in association with the brick foundation wall in this area. No artifacts were collected in association with this feature.

MT7 was excavated to the west of the brick foundation wall after soil probing suggested the presence of additional timber construction remains (see Figure 9.1). Excavations identified a single wooden beam and hard-packed sterile soils. Given its proximity to Cubbage Pond and the cofferdam, MT7 proved to be highly unstable due to wet sand; as such, excavations were unable to determine if additional wood beams or features were present in this area. It is possible that this beam was displaced from the nearby log foundation or wing wall.

### **Collection Units**

To collect artifact samples and delineate the mill's water system, collection units were established (see Figure 9.1) across the southern portion of the site (Photograph 9.15). Twenty 10x5-foot units were placed near wing walls, penstocks, and the waterwheel/ turbine area. Each course within the penstocks was mapped and the timbers removed prior to mapping subsequent layers. Three penstocks, representing up to five courses of timber, were observed and are described in detail in the next section.



**Photograph 9.15**  
***View of Collection Units (defined by strings)***  
***Overlaying the Remains of Cubbage Mill's***  
***Waterpower System. Looking East.***

Artifacts from the collection units (Table 9.13) included primarily architectural debris (e.g., cut and wire nails) and kitchen debris (e.g., soda, beer, and other unidentifiable bottles, ceramics). Identifiable ceramics consist of whiteware, redware, and stoneware ranging in age from early to mid-19th to mid-20th century. The presence of mid-20th century artifacts (pharmaceutical/toiletry/bottle glass) in the mill's water system likely is due to the construction of the overlying culverts during the last 50-80 years. Collection Units 8, 9, 10, and 18, nearest the mill addition and in the vicinity of the waterwheel and turbine pits (far eastern edge of water system area), contained the greatest densities (more than 100) of artifacts, especially architectural debris. This material likely washed in from the waterflow through the penstock and was trapped in the area of the turbine after the mill shut down.

**Table 9.13**  
**Cross-Tabulation of Collection Unit by Artifact Group**

Collection Unit	Kitchen	Architecture	Clothing	Personal	Tobacco Pipes	Floral	Other	TOTALS
CU1	--	--	--	--	1	--	--	1
CU2	1	1	--	--	--	--	3	5
CU3	1	2	--	--	--	--	--	3
CU4	--	--	--	--	--	--	--	--
CU5	4	26	--	--	--	--	--	30
CU6	5	36	--	--	--	--	2	43
CU7	6	28	1	--	--	--	--	35
CU8	29	155	2	2	--	--	19	207
CU9	16	91	--	2	2	--	4	115
CU10	78	57	6	11	--	--	18	170
CU11	1	4	--	--	--	--	1	6
CU12	--	--	--	--	--	--	--	--
CU13	5	4	--	--	--	--	--	9
CU14	--	1	--	--	--	2	--	3
CU15	3	3	--	--	--	--	--	6
CU16	--	1	--	--	--	--	--	1
CU17	2	11	--	--	--	--	--	13
CU18	28	112	3	--	--	--	3	146
CU19	--	7	--	--	1	--	3	11
CU20	34	39	--	1	--	--	4	78
<b>TOTALS</b>	<b>213</b>	<b>578</b>	<b>12</b>	<b>16</b>	<b>4</b>	<b>2</b>	<b>57</b>	<b>882</b>

## Summary of Archeological Features

Archeological excavations at Cubbage Mill uncovered many structural features, providing a better understanding of the construction of the mill (see Table 9.2). Structure-related features include the main mill building remains (brick foundation, floors), the east addition (structure piers, floor), and the log foundation. The excavations also revealed information on the water technology used to power the mill, including three penstocks, a culvert, wing walls, wheelpit, turbine pit, pond, sluice gate, dam, and tailrace. (The mill pond, sluice gate, and dam were not studied in detail during this investigation.) Other features are described below.

### ***Brick Mill Foundation and Associated Floors***

Manual and machine-assisted excavations successfully exposed the mill's brick foundation (see Figure 9.2). (Machine Trenches 1, 2, 3, and 5, TU6, and JSTP 3 and 4 examined the west foundation wall; Machine Trench 5, JSTP 1 and 2, and TU2 examined the north wall; and JSTP 6 and 7 and TU1 examined the east wall.) Much of the south wall was destroyed during construction of the road culvert. Collection Units 4-10 fell within the area of the south wall. The NE and NW corners showed evidence of either additional reinforcement or

replacement, as the brickwork bonding did not “match” construction methods on either side (see Figure 9.2)

Excavations also identified two superimposed floors, one concrete and one brick within the interior of the foundation (see Figure 9.2). A possible plank floor was identified beneath the brick floor in one excavation unit (TU1). The brick mill foundation measured approximately 24.5 feet north-south by 21 feet east-west. The south foundation was truncated, likely by the demolition of the mill building and the construction and maintenance of Road 214.

The construction method of the mill foundation was evident from the excavations. A series of brick or masonry piers were placed around the outline of where the mill would be built. Upon these piers were placed large beams (which served as sills for the foundation) that had circular saw cut marks, indicating a post-1850s date for cutting the beams (see Photograph 9.6). The brick foundation was laid on these wood sills. Archeologists observed that the brick foundation was laid in American bond, which is generally a 19<sup>th</sup>-century masonry technique. A row of brick headers, followed by five rows of stretchers, was observed directly above the masonry piers and sills. This row of brick headers was capped by another row of headers, the lower row falling at the same elevation as the interior brick floor.

The lower (bottom) seven courses of headers, followed by five courses of stretchers and one header, were one-brick-width wider than the upper five courses on the east and south wall (see Figure 9.9). The wider foundation forms the plinth, which is approximately 16-20-inches thick (four courses of brick). The plinth is the base course of a building that gives the appearance of a platform. The plinth, which is then stepped for the upper part of the foundation wall (12-14-inches thick; three courses of brick) is common for load-bearing walls of a large, heavy structure. Above the plinth are three courses of stretchers and another course of headers. Using mortar between the bricks, the top elevation of the western wall was 11.4 to 11.8 feet amsl.

Because the matrix around and beneath the foundation was wet and very sandy, the soils were unstable, tending to move or ooze. By using the system of wood sills and masonry footers to construct the brick foundation wall, the mill builders helped stabilize and/or minimize mill subsidence.

The weight of the structure and the unconsolidated soils must have continued to be a problem for mill owners because the excavations documented the addition of wood (piers) between the brick piers in some locations (e.g., TU1). On the west foundation, brick nogging was used to fill in gaps between the piers beneath the sills (Photograph 9.16). Adding these extra supports after the building was completed meant extra work, but was critical to building stability and essential maintenance. To add a wood pier required excavation of a small builder's trench where the support would be added. To add brick nogging beneath the sill entailed digging a builder's trench around the foundation, removing the soil and placing the bricks under the sill, and then replacing the soils around the foundation.

***Photograph 9.16***

***North and West  
Foundation Walls,  
Feature 1, MT 6,  
showing Locations of  
Wooden Sill, Piers, and  
Brick Nogging. Looking  
Southeast. Note Log  
Foundation in  
Foreground***



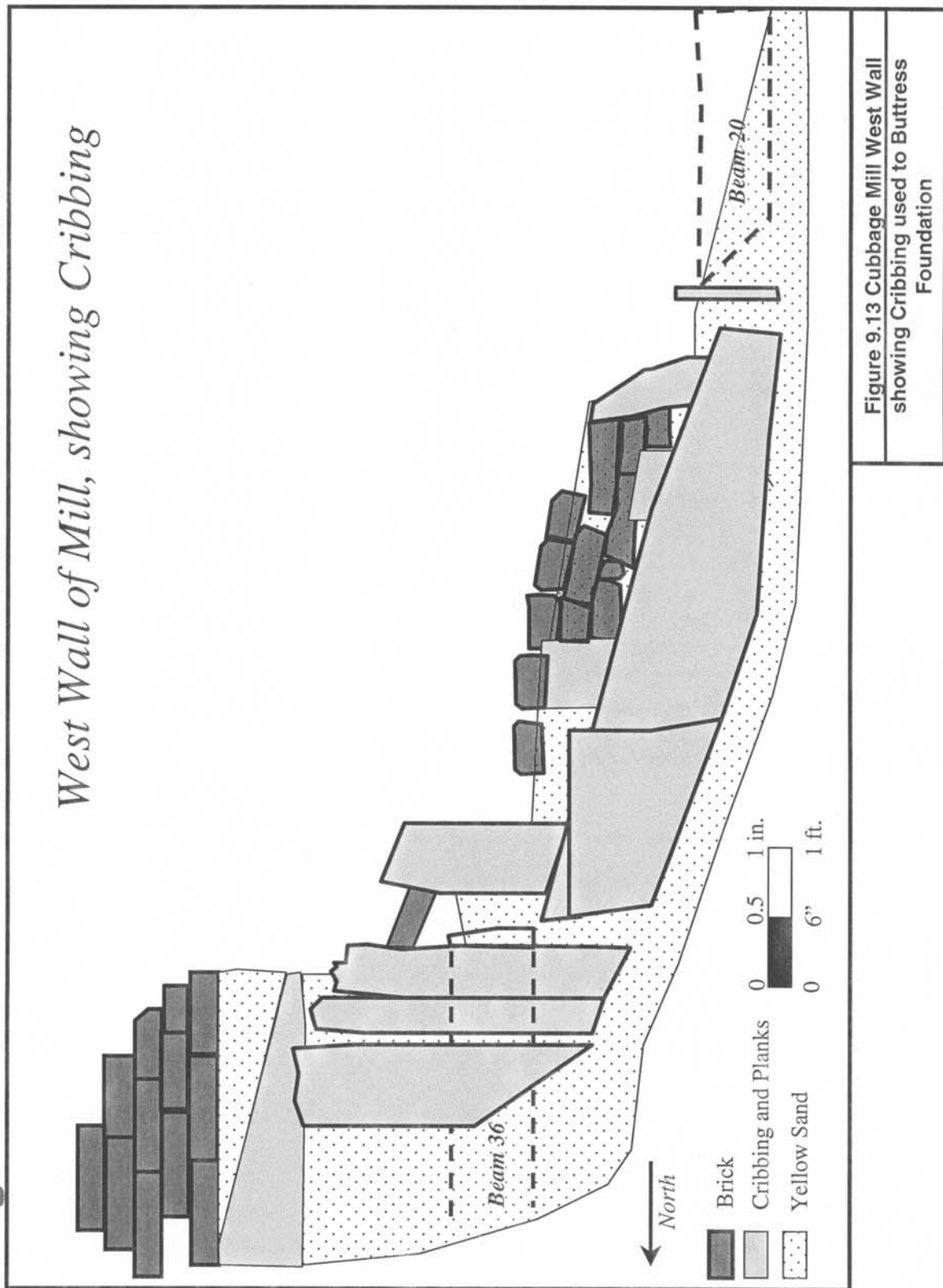
The bricks in the foundation wall were set using mortar rather than cement. This masonry construction practice was common until the 1890s when Portland cement production began in earnest in the United States. Portland cement adheres to bricks, acts as a strong bonding agent between bricks, and strengthens construction. Earlier mortars, like that used on the Cubbage Mill brick foundation, were used to help set the bricks but were minimally able to adhere or bond with the bricks to strengthen the foundation. This type of foundation construction was more prone to erosion or settling than one made with Portland cement.

Mill builders found other ways to help stabilize the mill structure. At Cubbage Mill, vertical cribbing was placed along the exterior of the west and south walls to protect the foundation from being washed out in case of flooding (see Photograph 9.13; Figure 9.13). (As noted earlier, these locations were predisposed to water damage if water spilling over the dam damaged the penstock.)

#### *Mill Floors*

Excavations within the foundation revealed the presence of three floors each constructed of a different material type: concrete, brick, and wood. Chronologically these are discussed from most recent to oldest.







### *Concrete Floor*

A concrete floor was observed in Machine Trenches 1, 2, and 3, and TU1 and TU6 (see Figure 9.2). The concrete floor was located on the interior of brick mill foundation at a typical elevation of approximately 9.3 to 9.4 ft. amsl, which represents a depth of 2 to 3.9 feet below modern grade. Measuring approximately 0.20 to 0.25-foot (2 to 3 inches) thick, the concrete floor was described as being very sandy, almost a sandstone texture, with blue stones. Portland cement was not in common usage until the 1890s; therefore, it is likely that this floor represents 20<sup>th</sup>-century remodeling at the mill. This same type of concrete with bluestones was found in the earlier culvert. The culvert was inscribed “1900,” which provides a reasonable date for these construction elements. The concrete floor covered the interior of the mill brick foundation and was also present in part of the east addition at an elevation of approximately 9.4 ft. amsl. This would present a relatively level concrete slab across both the main structure and east addition. This concrete slab could have served a dual purpose as both an equipment pad and floor.

There was visual evidence for brick equipment supports and hardware fasteners on the concrete floor exposed in MT-3 (see Figure 9.2), including a brick support measuring 3.9 ft. (north-south) x 1.1 ft. A second support (north-south-trending brick footer), approximately 0.7-ft. wide and a single course of brick, ran through the center of the structure; the visible portion of the footer measured 12.4 ft. north-south (the entire length of Trench 3). Another equipment support exposed in Trench 3 was identified along the inside of the west foundation wall, near the southwest corner of the mill foundation. This footer measured 5.4 ft. x 0.6-ft wide, and was represented only by the mortar that once bonded the bricks to the concrete floor.

TU6 excavation also exposed two vertical iron bars driven into the brickwork. One was located in a footer along the west foundation wall and the other was located in the brick floor (Figure 9.9). There was concrete (with blue stones) similar to that poured around the anchor bolt driven into the brick floor, indicating that these equipment fasteners were used during the period when the concrete floor represented the 20<sup>th</sup>-century work surface.

### *Brick Floor*

The brick floor exposed in TU1 and TU6 (see Figure 9.2; see Photograph 9.5), was located approximately 0.4 ft beneath the concrete floor, at an approximate elevation of 8.3 to 8.7 ft. amsl. The brick floor was composed of a single course of full and partial bricks in a patchwork pattern that spanned these units abutting the mill’s brick foundation wall. The bricks composing the floor were dry laid and seated in a gray sand base.

Evidence of a fire is suggested by several burned cut nails and burned wood fragments atop the floor, in conjunction with the observation that several bricks were charred in both test units. In addition to nails and wood fragments, artifacts recovered from the brick surface included late-19th-century coarse redware, and refined white earthenware ceramics and window glass. (There was a layer of relatively sterile soil sealed between the brick floor and the concrete floor.) Following the fire, the mill was flooded, leaving sand deposits atop the brick floor and burned debris. Later, the concrete floor capped these flood deposits.

One of the most interesting observations of the brick floor was in TU6, where two large rectangular openings were observed in the brick floor (see Figure 9.9). It is assumed that

these openings were associated with equipment supports during the period when the brick floor represented the location of machinery from circa 1860s-1900. The presence of sawdust in the soil matrix beneath the floor may indicate that these openings were associated with anchoring equipment used to power circular saws during the brief period that the sawmill was in operation.

Archeologists removed the brick floor to determine its date of construction, and when the mill burned. The removal of the brick surface revealed a stratum containing additional brick rubble and burned wood. An assemblage of lead-glazed and refined white earthenware sherds, pharmaceutical vial fragments, and window glass sherds—some of which were melted—clearly indicate that the mill burned in the mid-19th century before the brick floor was laid and then, as discussed above, after the brick floor was laid and before the concrete floor was poured ca. 1900. Thus, not only were mill operators concerned about flood prevention (as reflected in cribbing along the west and south foundation exteriors), but also about fires in a building constructed, at least partially, of wood and containing highly combustible materials (i.e., grain dust and sawdust).

#### *Wood Plank Floor*

The wood plank floor was intact only within a small portion of TU1, beneath the brick floor in the lower rubble layer. This rubble layer was also found beneath the brick floor in TU6. The wood floor and associated rubble layer (up to 1.2 ft thick) represent an early to mid-19<sup>th</sup>-century work surface. Wood beams, planks, cut nails, white ball-clay pipe fragments, ceramics, leather, and pieces of bottle glass and window glass were found within this rubble. The depth of this floor would have had an approximate elevation of 7 feet amsl, which is only one foot below the level of Swiggetts Pond located just downstream from the tailrace. For positive water flow away from the waterwheel or turbine, the tailrace by the mill would have been at a higher elevation than this early floor, possibly suggesting that the tailrace was confined to a ditch.

#### ***East Addition and Associated Floors***

Shovel test and test unit excavations in the vicinity of the brick piers (located directly east of the brick mill foundation) confirmed the presence of a mill addition measuring at least 13 by 20 feet (see Figure 9.3). As described below, historical research indicates construction of the mill addition sometime prior to 1868. Photograph 9.17 confirms that the two-story lean-to addition was still appended to the primary mill structure well into the 20th century.

Archeological fieldwork confirmed that the concrete floor identified in the interior of the mill foundation continued eastward at the same elevation within part of the appended lean-to structure (e.g., TU5). In contrast to TU1 and TU6, however, burned layers were not observed in test units or shovel tests placed in the area of the eastern addition, suggesting that the fire may have been limited to the main mill structure, predating the construction of this circa 1860s addition.

Six brick or masonry piers were identified based on visual inspection and excavations of the area east of the brick foundation (see Figure 9.3). Four of the piers measured approximately 1.4 ft x 1.4 ft. Three of these piers may represent the location of the east addition wall or a line of central supports within the addition foundation. For ease of discussion these three aligned piers were numbered Piers 1-3 from north to south. The southernmost pier is

designated Pier 4. Pier 5 is located within TU3. Pier 6 was found on the western edge of TU5. Piers 1-3 were located approximately 13 ft east of the eastern brick wall of the mill foundation.



*Photograph 9.17*

*Circa 1950s Photograph of Cubbage Mill, Showing the East Mill Addition (left), Cubbage Mill Site. Looking Southeast.*

TU5, located directly west of the Pier 2, identified an east-west-trending cut sandstone footer (see Photograph 9.10). The cut sandstone terminated on the west at another masonry pier (Pier 6). As with the brick mill foundation, the sandstone footer was underpinned by a wooden sill supported with two vertical wooden stakes measuring approximately 0.25-foot in width by 0.75-foot in length (3x9-inches). Abutting Pier 2 and Pier 6, the footer may have served to support machinery inside the addition. A second cut sandstone footer was uncovered to the north (a concrete floor was between the two footers.) Informants indicated that, during the early- to mid-20th century, this location housed a kerosene engine for driving mill machinery during the winter months and/or during periods of low water (Albert Ladd and Harry Wilkins, personal communication, 1998). This interpretation is further supported by the fact that archeologists observed soils laden with fuel and oil residues in the area.

TU3 revealed an additional brick support (Pier 5) adjacent to a brick wall/footer extending south (beyond the limits of Pier 3), indicating that the east addition extended further south. The wall/footer was three bricks wide (approx. 1.2 ft.) and two brick courses (0.8 ft.) deep, abutted on its eastern face with Pier 5 (perpendicular east-west). Pier 5 was built of whole and fragmented bricks, and measured about 2.5 feet in length (see Photograph 9.8). It is likely that both the wall/footer and Pier 5 represent support for heavy machinery.

Within TU3, a brick rubble layer extended from about 1.0 to 1.8 ft. below the base of the brick wall/footer, with the base of the rubble located 2.8 ft. below the top of Pier 4. The small quantity of cut nails recovered within and beneath the brick rubble indicates that this construction was associated with an earlier period of site activity (ca. 1795-1820). Mill expansion was limited by marshy soils to the south, the mill pond, dam and road to the west, and to the north by the mill (basement) being set into an escarpment.

Flooding is one of the foremost hazards for water-powered mills. Evidence of frequent flooding of the addition was revealed by the 1 to 1.8 ft. layer of coarse sand with pebbles between the brick rubble and base of the pier and wall. The soils suggest that this location had been subjected to high-velocity water currents (coarse sand) in the early-19<sup>th</sup> century, followed by a period of gradual colluvial and alluvial (loamy sand) deposition. Another large flood episode occurred before the ca. 1868 construction of the brick wall/footer and Piers 4 and 5.

Cubbage Mill had to be built at the lowest possible elevation in order to obtain sufficient waterpower or head to drive the undershot wheel (and later, the turbine). With the elevation of the brick floor foundation in the main building at 8.3 to 8.7 feet and the concrete floor at 9.4 feet, the low elevation of the Cubbage Mill site was threatened by excess water surging from Cubbage Pond (elevation, 11 feet) and by excess water backing up from Swiggetts Pond, located downstream (elevation, 8 feet). Most mills were designed (with timber cribbing and wing walls) to cope with the occasional heavy rains or spring snowmelt that caused high-water runoff from the mill pond to flood over the penstock. Floodwater backup was a more serious problem because such levels of protection were not in place for water backup. Protection measures from upstream floods evidenced at the Cubbage Mill site included cribbing along the exterior of the west (upstream) brick foundation wall and between the penstocks and south foundation wall. Similar measures were not observed on the downstream (east) foundation wall. Brick rubble observed in the lower levels of TU3 probably represents destruction of this part of the mill during an earlier flooding episode (Photograph 9.18), much like the pond that formed in the tailrace area (less than 10 feet south of TU3) during multiple Nor'easters that hit during excavations.



***Photograph 9.18 Ponding  
Water from Three Storms  
Flooded all but the Uppermost  
Timbers of Penstock.***

### ***Outbuilding***

TU4, located approximately 20 feet northeast of the northeastern corner of the brick mill foundation (8 feet north and east of Pier 1), encountered two dense concentrations of brick rubble and demolition debris at approximately 2 feet and 4 feet below modern grade, respectively (see Figure 9.1). Due to severe water infiltration, archeologists were unable to excavate the deeper strata in TU4 to discern the nature and extent of possible structural remains. However, the recovery of architectural debris in TU4, including cut nails, spikes, and hinges, suggests that a small outbuilding may have been located in this vicinity at one time.

### ***Log Foundation***

The excavation of Machine Trenches 5 and 6 revealed what appear to be the northern and western walls of a log structure aligned with, and located due north and west of, the mill's brick foundation (see Figures 9-1 and 9-4) (see Photograph 9.14 and 9.16; Photograph 9.19). The northern log wall was located approximately four feet north and parallel to the northern brick wall of the mill foundation. The western log wall was located approximately two feet west and parallel to the western brick wall of the mill foundation.

***Photograph 9.19***

***Possible Corner-timbered Log Foundation, MT5 and MT6. Looking South. (Northwest corner at bottom right; Feature 1, upper left.)***



The logs were left “in the round,” rather than hewn. The half-lap corners on the logs meant that a flat surface was cut on the upper side to facilitate the placement of the upper perpendicular log. This corner-timbered method did not interlock the logs with compression. In general, this notching method left more space than usual between logs and did not shed water as well as other corner-timbered methods (Hutslar 1977). The logs were typically 1.0 to 1.7 feet in diameter, and the corner notches varied from 1.4 to 2.5 feet in length. Several rectangular posts were driven into the ground on the east side of the logs and were likely used to help stabilize the foundation.

Given the sheer dimension and characteristics of the construction, archeologists surmised that the log walls could represent the remains of an earlier mill foundation dating to the late 18th/early 19th century. Archeological excavation of the log feature failed to identify any structural elements or artifact remains that could more reliably define its function or date.

As noted earlier, archeological investigations of the brick foundation and the discovery of circular saw-cut sills indicate that the brick foundation must postdate the period from circa 1850s. If the log feature served as a foundation, it likely supported a mill pre-dating the mid-19th century. By extension, it is reasonable to conclude that the brick foundation that closely parallels the log footprint was built in the same general location to take advantage of the earlier, intact, dam, tailrace, and penstocks adjacent to Cedar Creek.

It is also reasonable to suggest that the log construction may simply represent the remains of a 19th-century bulwark or retaining wall designed to impede the effects of hydrostatic pressure from the proximal holding pond. Such constructions have been observed at other mills (Zimiles 1973: 40). In contrast to relative dating sequences that can be established for one foundation over another, it is impossible to determine the construction date of the feature. Such a secondary, albeit important, structural feature could relate to an earlier, undiscovered mill at this location or date possibly as late as the tenure of the Davis family at the turn of the 20th century.

### **Waterpower Systems**

Archeologists discovered remains of the waterpower system south of the brick mill foundation beneath the drainage culvert, which was once part of the waterpower system. These remains include the mill pond and dam (Photograph 9.20), wing walls, three penstocks or flume foundations, a turbine pit, and wheelpit. For the purposes of discussion here, the penstocks are numbered sequentially as Penstock Nos. 1-3 from upper to lower courses, respectively.

***Photograph 9.20***

***View North of Cubbage Mill Pond, Road 214, and Cedar Creek. Archeological Excavations in Background, near Cranes.***



### **Wing Wall**

The functions of the wing walls were to help channel the water into the headrace and to help protect the mill from hydrostatic pressure from the impounded water in the mill pond. The remains of two wing walls (north and south wing walls) of the dam that impounded Cedar Creek were identified in the course of archeological investigations at Cubbage Mill (see Photograph 9.20; Photograph 9.21). The south wing wall alignment measuring approximately 7 feet (northeast-southwest), extending from the penstock toward Cubbage Pond. This was in poorer condition than the north wing wall and only that part closest to the penstock was preserved.



**Photograph 9.21**

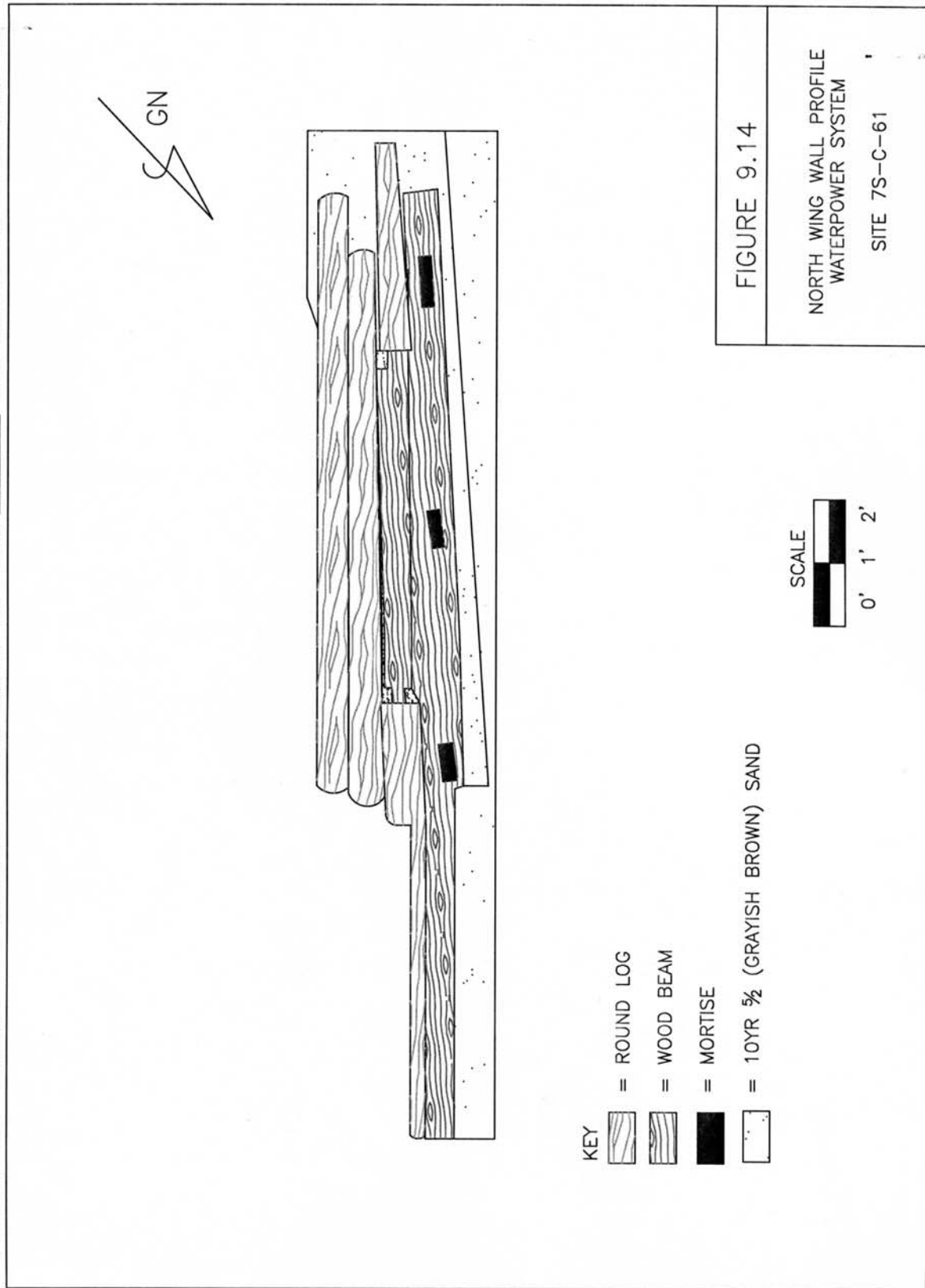
***Northern Wing Wall (foreground) and Penstock No. 2 (center), Cubbage Mill Site. Looking Southeast. Note vertical planking lining the center between the wing walls (right center).***



The north wing wall was in good condition and provided insights into wing-wall construction methods. It was comprised of an alignment of timber courses measuring approximately 14 feet and running northwest-southeast. There were four timber courses articulating with the western limits of the east-trending millrace (Figure 9.14). The two upper courses were composed of round logs measuring approximately 9 feet in length and 0.5-foot (6 inches) in diameter. The third course was composed of a round 3-foot-long by 0.5-foot-thick log abutted to 5.5-foot square beam. The beam, manifesting a central mortise-and-tenon on its opposing ends, was abutted to a square block measuring 0.75-foot (9 inches) thick and approximately 2 feet in length. The fourth and lowest course was represented by a single beam measuring approximately 15 feet in length and manifesting three mortises, each measuring approximately 0.16 by 0.5-foot (2 by 6 inches) on approximate 3.75-foot centers.

The large size of the logs and mortise-and-tenon joinery indicate that the structural beams composing the third and fourth courses of the wing wall likely were recycled from a standing structure once on or near the property, possibly an earlier mill structure. Recycling elements from other buildings in the construction of the mill and its components was demonstrated throughout the Cubbage Mill site.

Archeologists also observed numerous vertical boards and planks facing the exterior aspect of the wing walls. As observed at other mills and elsewhere at the site, especially at the southern extent of the foundation (fronting the penstock), these planks likely served as heartening boards designed to further retain unconsolidated soils and impede water leaks into the mill structure and waterpower area.



### **Culvert**

Near the wing walls (adjacent and to the east), archeologists observed a large concrete box culvert directly below Road 214, at the southern extent of the mill atop the millrace. The culvert functioned as a penstock to channel water from the pond to a turbine located further east (Photograph 9.22) and was likely associated with road construction. In the process of exposing the feature for documentation and removal, archeologists determined that the culvert was composed of two parts: the westernmost section constructed or replaced circa 1900 as observed in the date inscribed in concrete, and an eastern section that was built or partially rebuilt, when the road was widened, possibly as recent as 1968. In the process of mechanically removing the base of the culvert, archeologists uncovered what appeared to be a section of platform that exhibited a circular opening (Photograph 9.23).

***Photograph 9.22***

***Profile View, Waterpower System (following removal of culvert section). Looking North toward Main Mill Structure. Note multiple courses of beams representing overlapping penstocks.***



***Photograph 9.23***

***Base of Culvert showing Circular Area Likely Housing Turbine, Cubbage Mill Site.***

ledge that may have secured an iron band used to support a turbine. Clearly, the culvert and platform had been constructed (or adapted) to accommodate milling at the turn of the 20<sup>th</sup> century. Available reconstructions indicate that the platform was positioned inside the culvert in a manner that permitted access and maintenance. The turbine would have been housed in a box-like area above the base of the culvert. Water flowed into the “box” and

built up pressure, forcing the water to turn the turbine before exiting through the outlet in the platform base. After mill operations ceased, the turbine was removed, but water in the culvert continued to drain into the box, through the outlet hole, into the tailrace, and on to Swiggetts Pond. This discovery confirmed informant reports of Cubbage Mill transition from waterwheel to turbine-power.

Intending to identify additional penstock courses, archeologists mechanically removed the concrete culvert, revealing details of the mill's evolving waterpower system. Excavation uncovered a turbine pit, a wheelpit, and at least three different penstocks (Figure 9.15, top). Beams from the penstocks were sampled for dendrochronology analysis, including identification of wood species (Figure 9.15, bottom).

### **Penstock No. 1**

Directly beneath the culvert, archeologists observed a series of north-south-trending beams (1 through 10) that comprised the foundation for Penstock No. 1 (see Photograph 9.15; Photograph 9.24; Figure 9.16; Figure 9.17; Figure 9.18). Seated on approximate two- to three-foot centers, the beams measured variously from 0.75 to 1.0 foot (9 to 12 inches) in width, and 0.3 to 0.6 foot (4 to 7 inches) in depth. In each instance, the long axis of the beam served as the primary foundation support for Penstock No. 1. In addition, a series of upright posts were observed on Beams 5 through 9, in conjunction with the remains of vertical cribbing surrounding the penstock foundation.

**Photograph 9.24**

***Upper Course of Beams in Penstock No. 1 that Supported the Concrete Culvert, Looking Southwest. Note concrete turbine pad (lower left) and west brick mill foundation wall (center right).***



The beams, oriented north-south, created an east-west penstock approximately 28 feet long. Beam 10 (approx. 21 feet long) represented the westernmost timber abutting the wing wall (see Figure 9.17). Pierced with several mortises, the sheer size and configuration of this white oak beam suggest a structural member containing a complex network of posts for tying the penstock into the wing wall structure. It remains possible, however, that it was recycled from another standing structure (see Figure 9.17; see Photograph 9.21). Beam 10, the largest of the laid timbers, was clearly positioned at the wing wall to provide support for the dam and penstock. Dendrochronological analyses indicate that the tree cut to make Beam 10 was approximately 130 years old.

The adjacent east-trending Beams 6 through 9 measured variously from 11 to 12 feet in length (north-south) and, like Beam 5 (approximately 16 feet long) to the east, were mortised in several locations. Beam 5 was also a white oak and produced from a tree that was about 128 years old. White oak timber is a heavy, tough hardwood found in deep, moist, well-drained soils, and was commonly used for beams, railroad ties, flooring, and barrels.

Additionally, mortised Beams 5 through 10 exhibited remnant posts, apparently providing lateral support to the concrete culvert. Posts on Beam 10 measured approximately 0.75 ft. (9 inches) square. Post 211 (in Penstock No. 1) probably served to further bolster the southern wing wall (see Figures 9.16 and 9.17). Two additional posts (Posts 210 and 212) were centrally placed, spanning a north-south distance of about 8 feet in width.

Several posts averaging 0.5-foot (6 inches) square (e.g., 208, 209, 213, 215, and 216) served to frame an approximate 14-foot-long cribbing wall along the north and south sides of Penstock No. 1 (see Figure 9.17). A sample taken from Beam 215 for dendrochronological analysis indicated that the wood was Tulip poplar, commonly found in deep, moist soils. Wood from this species was generally used to make clapboard siding, cabinets, and organs. In conjunction with the noted posts, the formed rectangular enclosure (four-sided vertical cribbing) represents a solid, well-formed construction designed to support the culvert atop the mill (see Figure 9.18).

The side of the cribbing in relationship to the beams and timbers indicates the direction of potential outside forces on this protective sheathing (see Figure 9.17). The cribbing on the west side of Beam 10 was used to prevent dirt and water from entering the penstock foundation from the direction of the dam. Likewise, the southern cribbing along Beams 5-9 was on the south side of the upright posts forming the penstock. This would have protected the penstock from dirt and water pressures to the south. However, the cribbing on the north side of Beams 5-9 was placed on the interior (south) side of the upright posts, indicating that this cribbing was meant to protect the mill from water leakage or overflow from the penstock.

It is an interesting comparison that adjacent Beams 1 through 4 (to the east) are noticeably smaller and do not exhibit any cribbing along their course. Beam 3 was identified as a white oak species, but was produced from a 66-year-old tree, compared to the 125-year-old white oak trees that formed Beams 5 and 10. It does appear that Beams 1-4 deteriorated more than Beams 5-10. A remnant of a mortise joint was found on the south end of both Beam 2 and Beam 4. Beams 3 and 4 must have suffered some subsidence that was rectified by placing smaller, east-west, crossbraces underpinning Beams 3 and 4 (see Figure 9.17). Each measuring approximately 2.5-feet long by 0.5-foot (6 inches) wide by 0.33-foot (4 inches) thick, the crossbrace beams suggested that there were additional underlying courses associated with the concrete culvert. No evidence of the timber cribbing was apparent on the north or south sides of these beams. Clearly, the construction of the more recent culvert (ca. 1968 improvements) in this area was structurally sufficient, requiring no vertical supports.



The removal of the upper course of Penstock No. 1 revealed a second course of 10 north-south beams (Beams 11-19 and 28; see Figure 9.16). Beam 18, representing the westernmost timber, was seated directly beneath Beam 10, abutting the wing wall. Similar in dimension to its superior counterpart, Beam 18 measured approximately 19 feet in length and had mortises cut in six locations on approximate 3-foot centers. Moving eastward, mortised Beams 28, 17, and 16 measured variously from 8 to 9 feet in length. Beam 15, located directly beneath upper-course Beam 5, measured approximately 12 feet in length, and like Beam 18 to the west, was mortised on approximate 3-foot centers. Cribbing was observed on the east vertical face of Beam 15 confirming the association between the first and second courses of timber (Figure 9.19).

As noted in the upper course, archeologists observed that the second-course timbers lying east of Beam 15 were conspicuously shorter, measuring variously from 8 to 9 feet in length. Moreover, the east-west timbers observed in the upper course were confirmed to crossbrace and tie Beams 13 and 14 and Beams 11 and 12. It is unclear whether the crossbraces were designed simply to strengthen the penstock or to serve another construction purpose.

Based on the excavations, the upper course of Penstock No. 1 foundation was adapted to serve as a foundation for the concrete culvert. The lower course, located directly below the upper string of timbers, represented a penstock base and later served to stabilize further the culvert construction from subsidence caused by building in unconsolidated sediments. The lower course of timbers is positioned slightly east, or between, the upper course of beam. In addition to providing vertical support, the lower course may represent a builder's attempt to reduce the horizontal drift wrought by water pressure from the dam.

The dendrochronology study indicates that the upper course of Penstock No. 1 was built after 1881. Comprised of white oak beams with white oak and tulip poplar vertical timbers, the wood members from Penstock No. 1 appeared to be cut with a circular saw, consistent with this date. The lower wood members of Penstock No. 1 likely supported the wood sluiceway that supplied water to a turbine sometime before 1881. The upper course represents a rebuilding episode where the penstock, dating ca.1881, was replaced by the concrete culvert in 1900. In 1900, these upper wood members were then adapted to provide a stable foundation and support system for the concrete culvert.

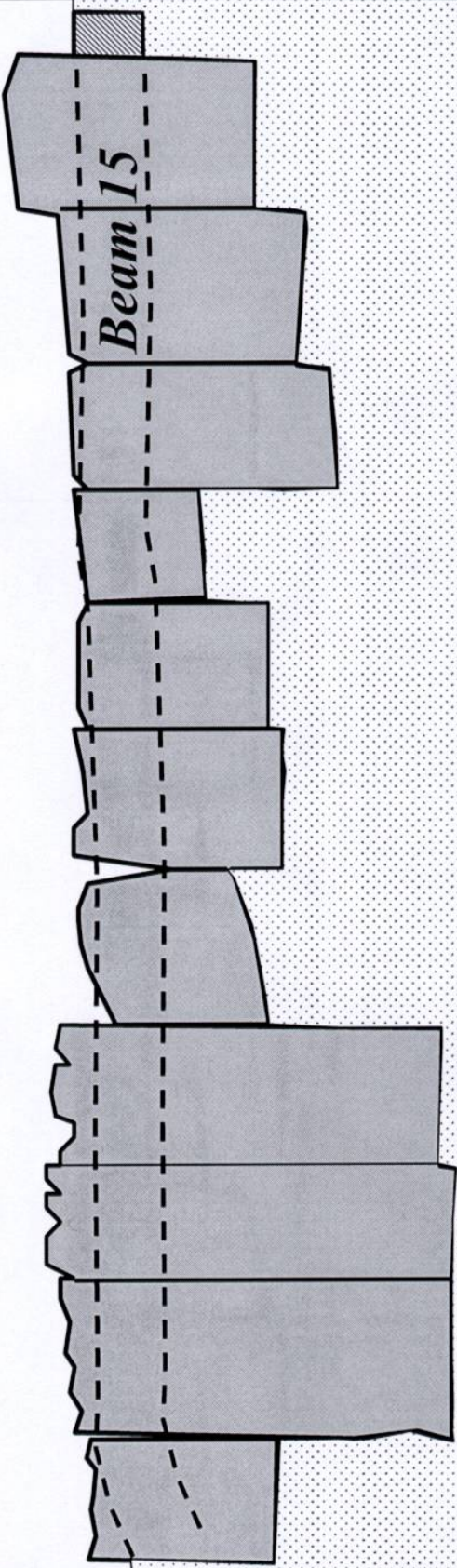
### ***Penstock No. 2***

To identify additional timber courses and discern evidence of earlier technologies, archeologists continued to excavate the penstock area. The upper surface of Penstock No. 2 was identified approximately one foot below the base surface of the overlying beams of Penstock No. 1. One of the most startling differences between Penstock No. 1 and Penstock No. 2 was the construction methods (cf. Figure 9.17 with Figure 9.20). The remains of Penstock No. 2 were composed of large hand-hewn beams enclosing a ladder-like rectangle of cross beams and braces (see Figure 9.20). Penstock No. 1 beams were cut with a circular saw and penstock did not have the additional east-west beams that tied other wood members together into one framework.



# Cribbing, Beam 15

Note: Planks were nailed to Beam 15 approximately 0.15-ft. below top of beam. Planks are tapered at base.



KEY

Wood Cribbing

Yellow Sand

--- Beam 15, Penstock No. 1

North

SCALE

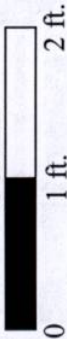


FIGURE 9.19

PROFILE OF CRIBBING, EAST SIDE OF BEAM 15, WATERPOWER SYSTEM SITE 7S-C-61

The mortised north-south timbers (20 and 21) comprising Penstock No. 2 each measured approximately one foot in width, and nearly 12 feet in length (Photographs 9.25 and 9.26). Two east-west beams (108 and 110), also measuring approximately one foot in width, were mortised and pegged into the north-south beams, forming a 4 by 11-foot rectangle (see Figure 9.20; Photograph 9.25).



*Photograph 9.25*

*Planview of Penstock No. 2, Cubbage Mill Site.  
Looking West toward Cubbage Pond / Cofferdam.*

Three crossbraces (32, 33, 34), each measuring approximately 0.75-foot (9 inches) in width and placed on approximate 3-foot centers, were mortised to the east-west beams, thus ensuring a solid base construction for Penstock No. 2 (see Photograph 9.25; Photograph 9.26; Photograph 9.27). Mortise-and-tenon joints were strengthened even further by using dowels. As a result, these beams had to be removed from the excavation as one unit (Photograph 9.28).



*Photograph 9.26*

*View of Cross Beams and  
Braces, Penstock No. 2.  
Looking West, toward Mill  
Dam.*



**Photograph 9.27**

***Beams 108 and 32, Penstock No. 2, showing Mortise-and-Tenon Joints. Looking West.***

The framework for the rectangular box foundation was well made. In a mill, a sturdy foundation minimized the vibration caused by machinery. Vibrations could quickly wear out the machinery and cause the mill to close for costly repairs and lost production time.

Seven beams made up this restructured foundation (Beams 20, 21, 32, 33, 34, 108, and 110)--all except Beam 33 were used for the dendrochronology study. Five of the six were hewn from white oak trees dated 166 (Beam 32) and 223 (Beam 20) years old before being felled. Beam 110 came from a 131-year-old Atlantic white cedar tree, and exhibited old mortise joints, indicating reuse from earlier constructions at the site. For the most part, then, Penstock No. 2 beams were cut from older white oak trees (probably harvested from nearby primary forests) and beams recycled from earlier construction activities.

**Photograph 9.28**

***Beams 20, 21, 32, 33, 34, 108 and 110 from Penstock No. 2 being Removed from the Excavation Area by a Trackhoe.***



As depicted in Figure 9.20, the north-south beams extend beyond the limits of the formed rectangle, which suggests that they may have articulated with similar penstock constructions no longer extant. As observed in superior courses, the sheer dimension of the timbers of Penstock No. 2, in conjunction with the presence of notches cut on the exterior face of the east-west timbers, likely indicates that at least one of these timbers was recycled from an earlier structure.

Given the proximity of the overlying concrete culvert and beams, it is not surprising that Penstock No. 2 retains no vertical elements associated with the walls that once surmounted its base frame. These were probably destroyed by flood or dismantled prior to the construction of the concrete culvert.

Dendrochronological analysis rendered a circa 1824 date for the timbers comprising Penstock No. 2 (western portion associated with the base of the turbine pit) below the concrete pad (see Figure 9.20). A conjectural reconstruction of Penstock No. 2 and its associated turbine pit is shown in Figure 9.21. Notwithstanding the possibility that the timbers were recycled from an earlier building, Penstock No. 2 may for a time been associated with an earlier waterwheel pit identified at Cubbage Mill (discussed below). Turbines were likely added to the mill during the period from 1863-1868. It appears that the penstock was not altered during this period; however, the waterwheel pit was modified for use as a turbine.

### ***Penstock No. 3***

After documenting and removing Penstock No. 2, a plank floor was observed approximately one foot below the base of Penstock No. 2 (Figure 9.22). Identified as Penstock No. 3, the feature is composed of six east-west planks measuring variously from 1.00 to 1.25 feet (12 to 16 inches) in width and approximately 8 feet in length. The planks were supported on the incomplete remains of a rectangular frame composed of an east-west timber (122) measuring 12 feet in length, and two north-south timbers measuring approximately 8 feet (Beam 38), and 11 feet (Beam 40) in length (Figure 9.23). Two intermediate timbers (41 and 42), measuring approximately eight feet in length and concealed by the plank floor, served to tie the frame. Beam 122 had slots cut into its side, where Beams 38, 40, 41 and 42 rested. This is more consistent with the manner of floor joists and would not be as strong a joint as the in Penstock No. 2. Beam 118 is all that remained of the western end of the penstock foundation.

Penstock No. 3 was represented by six hand-hewn timbers. Four were subjected to dendrochronological analyses and determined to be Atlantic white cedar and red oak; this course was dated circa 1703, indicating that the trees from which these logs were cut date after 1703. Atlantic white cedar grows in swamp-bogs along the Coastal Plains and is known for its durability and resistance to decay and rot. The site history clearly indicates that the first mill dates no earlier than the last quarter of the 18<sup>th</sup> century; as such, it is reasonable to conclude that Penstock No. 3 timbers were either scavenged or recycled from older ruined structures on or near the property.

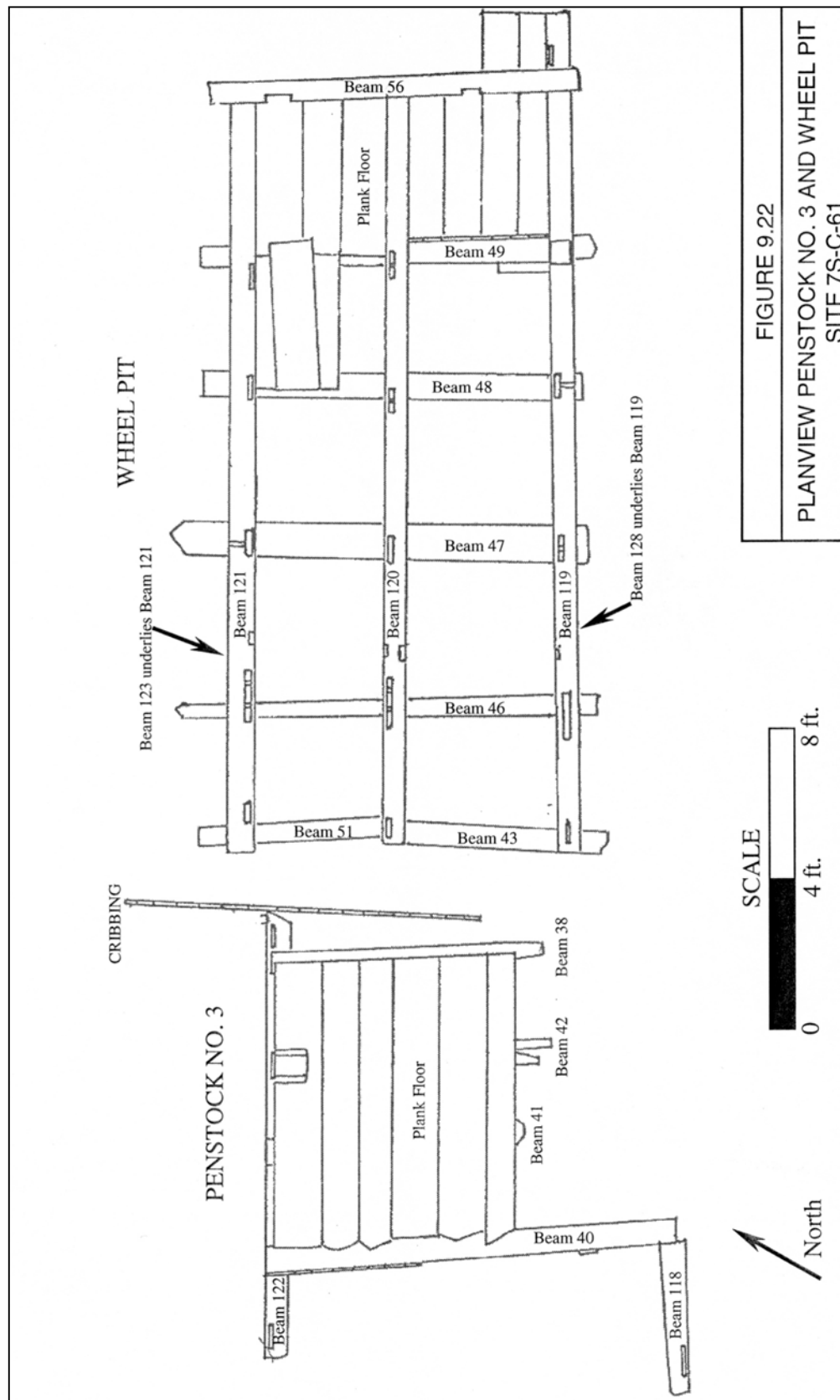
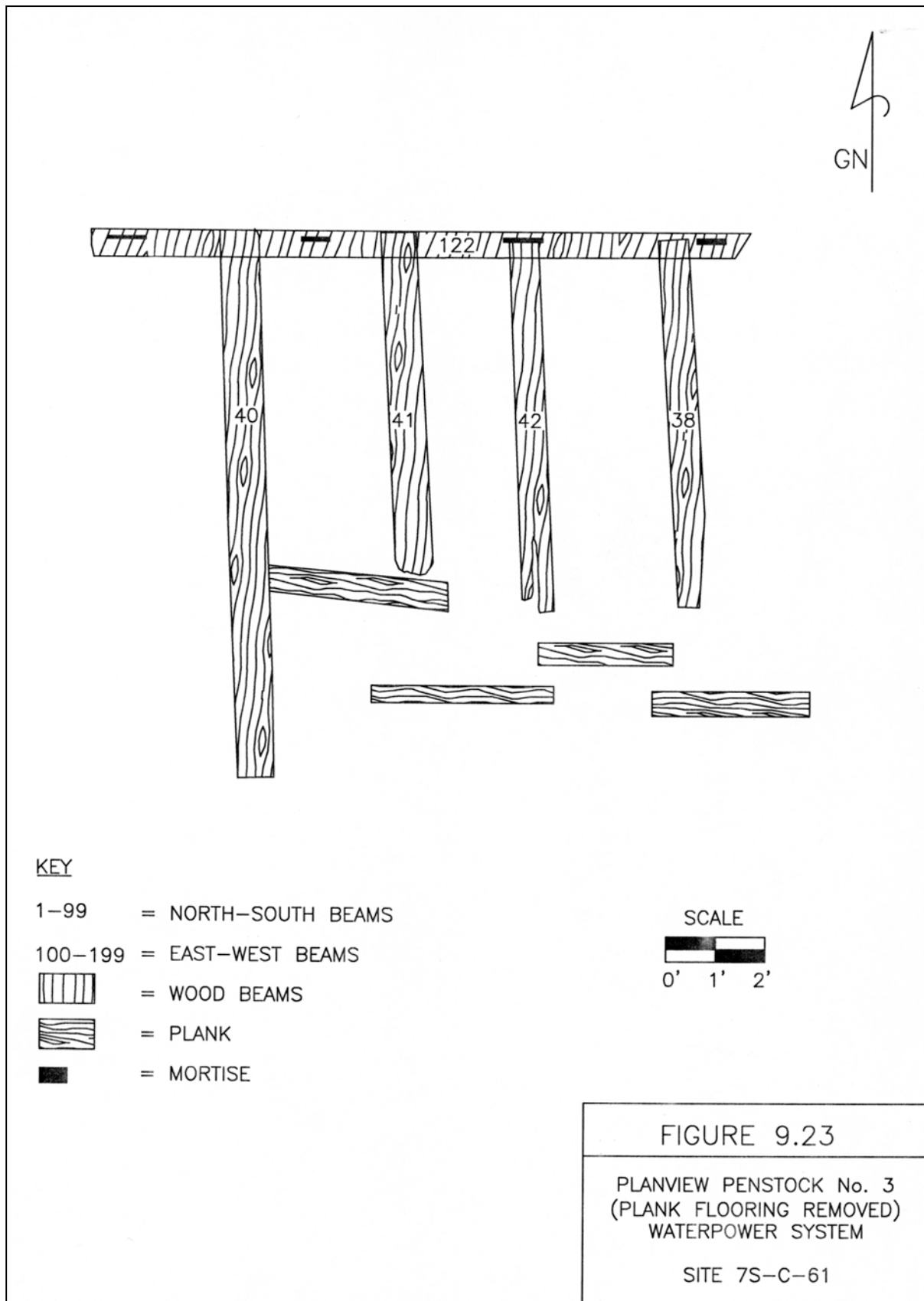


FIGURE 9.22

PLANVIEW PENSTOCK NO. 3 AND WHEEL PIT  
SITE 7S-C-61





The plank floor and underlying beams and braces constituting Penstock No. 3 provide archeologists with a fuller view of the intact remains of the base of a penstock (see Figures 9.22 and 9.23; Photograph 9.29). Located directly west of the wheelpit frame, also primarily constructed of Atlantic white cedar, Penstock No. 3 can clearly be associated with the waterwheel system at Cubbage Mill (Figure 9.24). Indeed, the number of unused notches and mortises were evidence that the Cubbage Mill penstocks and wheelpit were cobbled together with elements of earlier structures.

***Photograph 9.29 Planview, Penstock No. 3 (planking removed), Cubbage Mill Site. Looking West.***



***Photograph 9.30 View of Cubbage Mill Turbine, Circa 1951. Looking North from Tailrace through "Penstock Door."***

### ***Turbine System***

The invention of the mechanical turbine in 1827 is attributed to Frenchman Benoit Fourneyron. Designed with curved-fixed vanes, which turned against an inbound water flow, turbines produced increased energy, which outstripped the dynamic capabilities of most water-wheel systems. Enclosed within a strong iron casing that promoted increased pressure and power, water was most often delivered to the turbine through a single vertical pipe composed of wood or iron. This does not appear to be the case at Cubbage Pond. Unlike areas with sufficient elevation (e.g., Piedmont), the lack of head in the relatively flat coastal plain provided a challenge to local millwrights.

At Cubbage Pond and other area mills (e.g., Cedar Creek Mill, Abbott's Mill), the turbine was placed at the bottom of a rectangular chamber formed by a watertight penstock made of concrete and wood (Photograph 9.30).

Sealing a small door at the tailrace end of the chamber caused the penstock to flood, which provided for the necessary pressure to run the turbine. In contrast to cumbersome waterwheels, smaller turbines were more efficient and enabled millers to work throughout the year. Before the advent of the turbine, millers often discontinued operations when winter ice impeded waterflow or threatened to damage or destroy the waterwheel. In some locations, turbine operators could safely submerge feed pipes below the ice layer to work without suspending production.

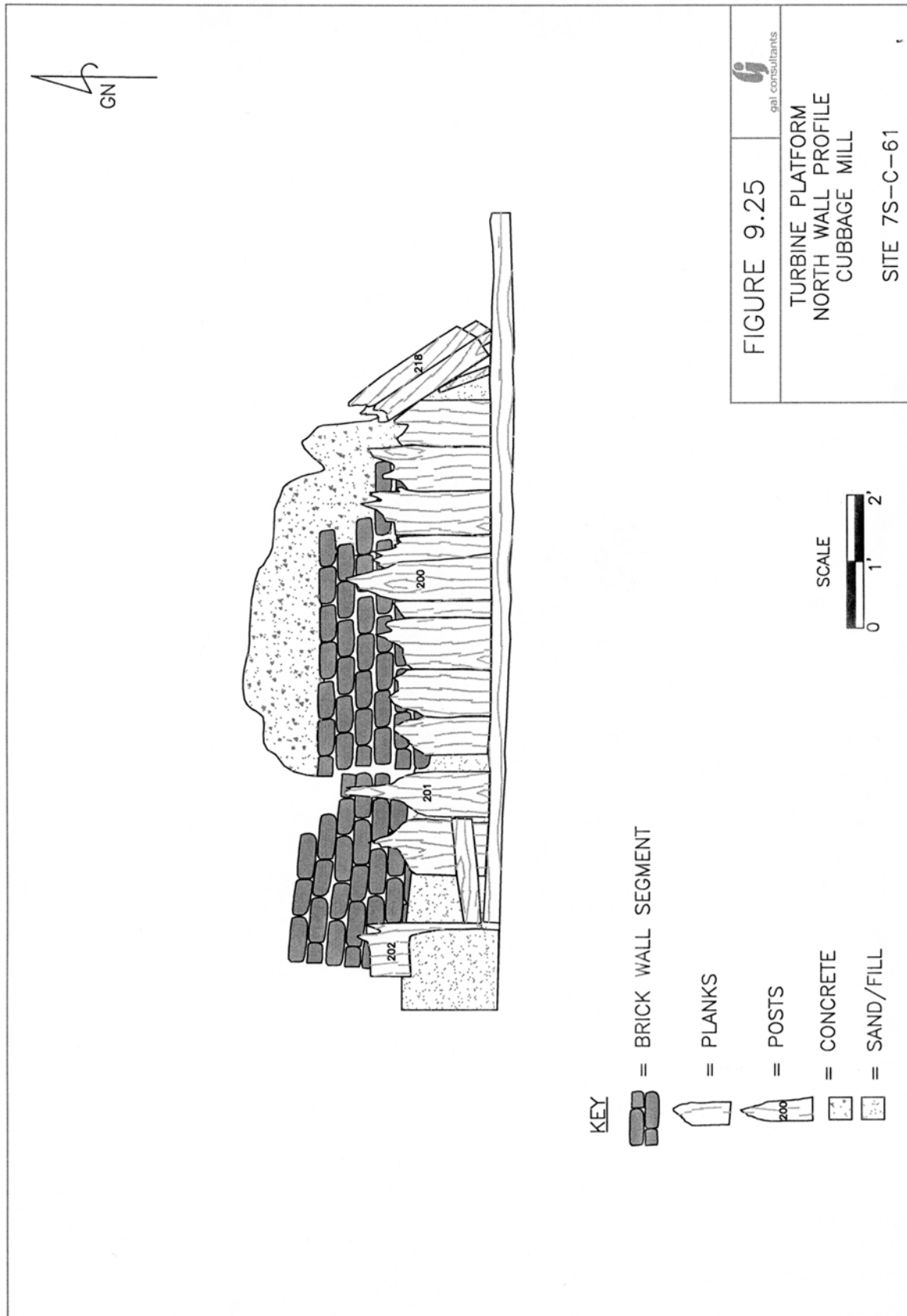
The probable remains of two turbine seats were identified at 7S-C-61. These features indicate that the operators of Cubbage Mill accommodated technological developments in an attempt to improve economic advantage. A review of the 1880 U.S. Manufacturing Census indicates that two turbines operated at Cubbage Mill during this period, with the maximum height of fall at Cedar Creek standing at four feet.

The circa 1900 concrete culvert composing Penstock No. 1 manifested a circular opening in its base (near its eastern limits), which would have supported a turbine (see Photograph 9.23). On a general level with Penstock No. 2, but forming the base of Penstock No. 1, archeologists observed a large 0.75-foot (9-inch) thick concrete pad measuring approximately 7.5 feet north-south by 9.5 feet east-west at the eastern limits of the millrace (Photograph 9.31). The pad rested atop Beams 23 and 24 (which abutted Beams 25 and 27)--all measuring approximately 10 feet in length, on the east and west sides, respectively (see Figures 9.17 and 9.20).



***Photograph 9.31 Concrete (turbine) Pad in Eastern Portion of Mill Race. Looking West. Note vertical planking to the right.***

Vertical posts (200, 201, and 218) abutted the northern limits of the concrete pad (see Photograph 9.31, Figure 9.25). These 0.75-foot (9 inch) square posts probably served to secure the cribbing wall, stabilize the pad, and provide additional retention of soils between the brick foundation and penstock area. Posts 202 and 219, which lay just beyond the concrete pad and are aligned with the pad posts, probably served the same purposes.



A 7-foot-long by one-foot-thick concrete wall directly to the north was probably used as a support for the turbine at this location (Photograph 9.32; Figure 9.25). A rectangular opening measuring approximately 1.75 feet north-south by 3.5 feet east-west was observed slightly west of the concrete pad's center. A cluster of wooden pilings identified inside the opening, below the pad, probably provided additional support to the turbine (see Photograph 9.24; see Photograph 9.31).

Historical research indicates that a turbine was installed or improved at the site ca. 1868 (see Chapter 3). This date corresponds with the completion of some major renovations at the mill attributed to Charles Miles, a millwright and owner of Cubbage Mill in the 1860s. The culvert and turbine pad likely dates to 1900, a date inscribed in the concrete culvert. Beneath the concrete turbine pad is a pit associated with Penstock No. 2 (see Figure 9.20; see Photograph 9.31). The large size of this turbine area would indicate that it was originally constructed as a waterwheel pit and later converted for a turbine.



*Photograph 9.32 Turbine Area, after Removal of Concrete Pad. Looking North.  
Section of south brick foundation and concrete wall (top of Photograph)*



### Wheel Pit

The remains of a wheelpit were located at the eastern terminus of the lower penstock approximately 3.5 feet below datum (see Figure 9.22; Photograph 9.33). The feature composed a lattice of three east-west-trending beams (Beams 119-121), each measuring approximately 0.75-foot (9 inches) in width and 20 feet in length, mortised with six north-south beams (43/51, 46-49, and 56), measuring approximately 11 feet in length and ranging from 0.75-foot (9 inches) to one foot in width. Of special interest, the westernmost beam comprising the frame contained two timbers (43 and 51), which were lap-jointed below Beams 119 and 121 atop the central east-west beam (120). Seven of the beams (Beams 43, 46-48, 51, 120, 121) used in the dendrochronology analysis were Atlantic white cedar. This tree species was also used for the construction of Penstock No. 3, which is associated with this wheelpit and Beam 110, a recycled Beam used in the construction of Penstock No. 2. It seems likely that Atlantic white cedar was found in the virgin forests of the marshes around Cedar Creek and may explain the stream's name.

**Photograph 9.33**

**View of Wheel Pit, Cubbage Mill Site. Looking East toward Tailrace. Note remnant planking comprising floor of wheelpit (top)**



A series of mortises were observed on the superior aspects of each of the three east-west beams (see Photograph 9.33). Cut generally atop the north-south braces, the mortised beams indicate that posts or vertical risers might have been secured at these locations. The cross-braced lattice appears to represent a standard building frame at the site as evidenced in the adjacent penstock floors. As noted in other portions of the waterpower system, the east-west timbers composing the wheelpit exhibited a series of notches and mortises on lateral faces that do not appear to relate the milling frame structure, but were probably derived from the remains of an earlier structure and then adapted for use at the mill.

The plank flooring was preserved on the east end of the wheelpit (see Photograph 9.33). This flooring would have protected the beams forming the foundation of the wheelpit from being undermined by erosion from water coursing through the wheelpit. Although flooring is best preserved in this wheelpit, a floor would have also been present in the turbine pits beneath the penstock. They would have been placed across beams in a similar fashion to that shown in Photograph 9.34. A beam located along the south end of the mill may have served as the base of block that supported the waterwheel.

**Photograph 9.34**

***Detail of Plank Flooring in  
Waterwheel Pit***

Given the dynamics of a rotating wheel fixed to gear shafts, the single lattice construction would have represented the strongest means to secure a single wheel assembly from vibration, drift, or collapse. This would have supported a wheel that was about 16 feet in diameter with a breadth of nearly 8 feet.



The waterwheel pit--associated firmly with Penstock No. 3 was probably first constructed after the flood of 1799. Based on the dendrochronology analysis, this waterwheel pit was replaced by a new wheelpit in 1824 or later (associated with Penstock No. 2), and afterward, converted for turbine power. By the third quarter of the 19th century, turbines were outnumbering waterwheels. At Cubbage Mill, documentary evidence indicates that the waterwheel was probably in service no later than 1868, but was probably replaced in the late 1850s or early 1860s when the mill first incorporated sawmill technology.

The lowest course of beams was represented by two hand-hewn specimens of white cedar sunken into the streambed beneath the waterwheel pit. Unfortunately, the small sample size was not sufficient for a reliable date through dendrochronology. The site history clearly indicates that the first mill dates no earlier than the last quarter of the 18th century. These hand-hewn beams represent the earliest evidence of the waterpower system found at the site.

### **Dendrochronology Analysis**

In the absence of the recovery of datable archeological contexts, and in an attempt to date the mill's waterpower system accurately, various wood samples were collected for dendrochronology analysis. A chainsaw was used to cut samples of wood from selected timbers found at the site for this analysis (Photograph 9.35). Composed variously of oak, tulip poplar, chestnut, and cedar specimens, a key-year analysis was undertaken by Dr. Henry Heikkinen (Dendrochronology, Inc.) on each of the five vertical courses comprising this portion of the site (Appendix A).

It is important to note that although dendrochronology can often effectively establish the date in which a tree was cut down, it cannot establish precise dates for archeological features composed of timbers removed from their original structural context. It is clear that many of the beams used to construct the Cubbage Mill penstocks were likely derived from other standing structures for purposes unrelated to mill construction. As such, one must evaluate the penstock course dates presented below with caution.



Photograph 9.35

*Collecting Wood Samples for  
Dendrochronology Analyses*

The upper course of Penstock No. 1 (Dendrochronology Course 1) was represented by 41 identified timbers of which 22 were sampled. Composed variously of oak ( $n=16$ ) and tulip poplar ( $n=6$ ) species, applied chi-square and kappa values defined a circa 1881 date for Dendrochronology Course 1. All of these beams appeared to have been cut with a circular saw, consistent with this date. The lower course of Penstock No. 1 (Dendrochronology Course 2) contained nine white oak timbers (six were sampled) revealing a circa 1824 date for Dendrochronology Course 2. Interestingly, this course contained primarily hand-hewn timbers reflecting the early-19th century date.

Penstock No. 1 is represented by two timber courses dated 1881 and 1824, respectively. In combination, the two courses that occur at the upper elevation appear to have been derived from other constructions or underlying penstocks with the specific intent to support the concrete culvert.

The single course of Penstock No. 2 (Dendrochronology Course 3) was represented by 13 identified timbers of which eight were sampled. Composed of white oak ( $n=6$ ), tulip poplar ( $n=1$ ), and American chestnut ( $n=1$ ), Dendrochronology Course 3 was dated circa 1824. While the structural evidence is duplicitous, Penstock No. 2 may have serviced the earlier waterwheel mill at this location. Moreover, given the observation that Penstock No. 1 timbers may have been derived from lower courses, Penstock No. 2 may have originally contained elements that were introduced in the 1880s in the course of maintenance or rehabilitation. Indeed, Penstock No. 2 is elevated at grade with the concrete turbine platform. Such a late-19<sup>th</sup>-century upgrade or maintenance associated with the turbine would be expected. To some extent, this reasoning is supported by the presence of hand-hewn timbers in the western portion of the penstock, while those located beneath the turbine platform (to the east) are circular-sawed primarily—clear evidence of mill refitting to accommodate the later 19th-century turbine in this portion of the site. It should be noted that while each of the courses, for the most part, contained wrought spikes and cut or wire nails, a greater percentage of these early fasteners were associated with the lower courses (e.g., Penstock No. 3).

The single course of Penstock No. 3 (Dendrochronology Course 4) was represented by 28 identified hand-hewn timbers, of which 11 were sampled. Composed of white cedar ( $n=10$ ) and white oak ( $n=1$ ), Dendrochronology Course 4 was dated circa 1703. The recovery of highly desirable and easily worked white cedar, exclusively in lower courses, suggests that local supplies may have been exhausted by the early 19th century. As noted in Chapter 3, the site history clearly indicates that the first mill at the site dates no earlier than the last quarter of the 18th century. As such, it is only reasonable to conclude that the timbers used to construct Penstock No. 3 were derived from earlier structures on or near the property. Given the grade elevation of Penstock No. 3, it was undoubtedly associated with the waterwheel at Cubbage Mill. The fifth and lowest course was represented by two hand-hewn specimens of white cedar (Beams 123 and 128) sunken into the streambed beneath the waterwheel pit (Photograph 9.36). Unfortunately, owing to a small sample size, dendrochronology analysis failed to provide a reliable date for the course.

Historical and archeological evidence do not support the presence of a mill at the turn of the 18th century. As noted at Cubbage Mill, and on historic mill properties throughout the eastern United States (e.g., East Creek Sawmill Site, NJ; Morin et al. 1988:V35-V36), the builders freely and deliberately dismantled, robbed, and reused timbers as needs or opportunities arose. Precisely where these earlier structures were located and precisely what purpose they served—be it domestic or industrial—cannot be established. Suffice it to say, the presence of a waterwheel pit confirms that Cubbage Mill evolved from this earliest technology.



*Photograph 9.36*

*Excavating Beam 123 (left center) and Beam 128 (right center), Fifth Course, Waterwheel Pit.  
Looking East, toward Tailrace.*